COAL AGE

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There are many different ways of performing most any task, no matter how simple, but there is generally one way that is far superior to any of the others; often the best way is not the one adopted.

The cycle of operations carried out by some coal-mine managers when they decide to purchase new mine equipment, should convince any one that the last statement above is not extravagant.

If a man does not know himself what he wants, it ought to be reasonably evident that no one else can know, and yet every day mining men buy machinery under just such conditions and then cuss the maker thereof ever after. There is only one satisfactory way to purchase mine equipment—require your office force to prepare plans and specifications to cover the exact machine wanted (when we say exact, we mean exact) and then be sure that the machine furnished is precisely the one specified.

But, objects someone, that would require the services of an engineer, and we have worked out a plan that relieves us of that expense. When we need a new hoisting engine, coal washer or what not, we get up a circular letter giving in a general way our requirements and then let the various manufacturers prepare plans and estimates of what they recommend; from these we choose the one that looks the best to us.

US. No engineer within forty miles. Get on the other side of the fence and see what these manufacturers are up against. Most mine equipment is such that each piece of machinery has to be built special, and if complete and intelligent data are not at hand, the manufacturer has about as much chance of furnishing a suitable machine as a tailor would have of fitting a man whom he had never seen and whose order contained only a picture of the would-be customer and a note stating that he wished the suit to be brown.

Under such conditions the purchaser is furnished with proposals that cover wide variations in design and price, and these proposals are soon followed by the salesmen of the various companies competing for the business. When the decision is finally reached, it often occurs that the manufacturer who offered the lowest-priced machine, through the highest-priced salesman, carried off theprize.

What is the result?

1. Some six or seven manufacturers have prepared, at considerable expense, plans and specifications for which they receive no compensation. Frequently, the more conscientious ones send their own engineers to the mine to pick up the missing links; however, if the final plans are not passed on by an engineer in the employ of the purchaser, this work is never noticed.

2. One manufacturer has succeeded in selling a machine which will not give satisfaction and eventually his reputation as a builder will suffer because of its performance. You've heard the proverb about "give a dog a bad name;" well, he's the dog.

3. A purchaser has received a machine which will do everything except produce dividends and general satisfaction.

These facts cause us to believe that if some of the more promising of our young mining engineers, who are now earning their livelihood by time keeping and similar occupations, should be allowed to carry on investigations covering present and future requirements in mine equipment, the pay rolls of both the coal-mine operators and the manufacturers of machinery would eventually absorb the young engineers' salaries and still have room for the usual current charges.

Coal Mining Investments

By Eli T. Conner

Men in all ages have felt and responded to the lure of the "mines." The fascination of winning from Nature's store of wealth a great prize, by some "lucky strike," has always attracted the layman as well as those who are well informed in mining matters. Were it not for this optimism—the belief of the *prospector* in ultimate success that will bring him wealth; of the *operator*, in the turn of the market that will convert apparent failure into a profitable venture—the wonderful expansion in the mining activities of recent years would not have been witnessed.

Were mining ventures susceptible of the accurate forecast that is possible in most other lines of business, they would lose some of their attractions; and the well known risks would deter many from making similar investments. On account of the risks and uncertainties of coal mining, much larger profits are necessary and legitimate in *that* industry than in other well-established enterprises.

It is important, however, in all mining investments, to remember that each ton of mineral extracted requires a proportionate depletion charge; so that by the time the whole deposit is removed the entire capitalization will have been amortized, as regards the value of the mineral deposit. This fundamental principle is often lost sight of and, in consequence, many disappointments result.

Coal operators too often put off charging to their monthly or annual cost, an item for the depletion of coal reserves. This should be done as regularly, if not as often, as the actual payroll outlay; because, if it is not regularly shown, the operator is deceiving himself as to his actual cost of production; and when the margin between operating expense and net price realized is as narrow as it has been during recent years in bituminous mining, an apparent profit may really represent instead, an actual loss.

The amortization charge should not only provide for the ultimate extinction of the capital account, in respect to coal reserves, but should preferably include an item that will cover certain possible mining risks, such as floods, fires, explosions, faults, creeps or caveins, labor strikes, car shortage, shrinkage of shipments and other interruptions to regular production and losses. Lastly, but quite as important, the industry should bear its fair proportion of compensation to workmen who may be injured in the discharge of their duties, or to the families of any who may be killed by unavoidable accident.

Reference to these matters incident to coal mining, need not be taken as indicating that, when properly conducted, coal mining is relatively a less stable and profitable investment than the average business venture, in normal times. In considering a coal-mining proposition, however, it is not enough to know that coal exists under certain lands. To insure success, it is absolutely essential to ascertain the quantity and quality of the coal and to compare the facts ascertained, with the same facts in regard to other coals supplying the same market and with which the property to be developed must compete.

The cost of building and equipping a plant of economic capacity together with the cost of the coal lands will constitute the capital to be invested. The cost of producing the expected daily capacity, including depreciation and depletion, must be offset by the proposed daily tonnage and the average price per ton that may be realized for the product. It is also necessary to consider well the labor conditions in the region where the property is located; so that when all of these elements are carefully estimated the amount of capitalization necessary can be determined.

The mistake is often made that the cost of development is underestimated (at times perhaps intentionally, in order to get the work started); and the attempt is made later to make up the deficiency from the earnings. While there are some instances of this being successfully accomplished, it is hazardous to attempt to conduct a business on an insufficient working capital; as any interruption, such as is liable to occur in mining, may result in wrecking the project. On the other hand, it is almost as great a mistake to provide too much money for a given project, as this tends to extravagance on the part of the construction engineer, whose tendency is naturally toward incorporating features that may be desirable from an engineering point of view but are not justified from a commercial standpoint.

In addition to the matters mentioned, it is essential that the market conditions, transportation facilities, freight rates, etc., be well considered to insure a fair competitive chance for the disposal of the output. I have thus tried to make clear that to estimate correctly the value of a mining venture requires painstaking study and careful weighing of many factors any one of which, if ignored, may seriously cripple the scheme. After the project is launched, it should be evident to anybody that men trained by education and experience should be put in charge as officers, superintendents and managers. It seems unnecessary to make this statement but for the fact that so many instances are known of manufacturers, druggists, doctors, lawyers, preachers and others equally uninformed, are constantly venturing into mining investments without competent advice and attempting to direct and manage the operations, with the usual result of partial or complete failure.

It is almost unaccountable why men of good business acumen in their own lines, will essay to go into a business as complex and exacting in its requirements for success as coal mining; or allow themselves to be persuaded by some smooth-talking seller of so called mining securities, into purchasing stock that if subjected to the most elementary analysis by experienced mining men would be found wanting in the essentials of a paying proposition. The only explanation for this credulity is the gambling spirit, which most men possess to a greater or less extent. The willingness to "take a chance" in a mining venture is found in many women also, who fall easy victims to the glittering prospects held out by the vendor of insecure mining securities.

The points to be investigated *before* making an investment in coal mining seem so obvious that it appears needless to emphasize them. Nevertheless, many instances are daily occurring that show the gullibility of uninformed investors, in their readiness to buy worthless mining stocks; and it is hoped this article may both benefit meritorious projects and help to expose worthless ones. Do not wait until part or all of the investment is made before fully investigating the project. *Do it first.*

Central Washer of the Ala. F. & I. Co.—I

By Edw. H. Coxe*

SYNOPSIS—The first of a series of two articles on this interesting plant. A description of the extensive holdings of the company are given here and some preliminary remarks on the methods of washing.

This company was organized in 1906 by the late Henry F. DeBardalaben, one of the pioneers of mining and furnace building in the Birmingham district. Their coal holdings consist of 24,660 acres in the Cahaba field, lying about 20 miles south of Birmingham, Ala.; 12,660 acres of this is in what is known as the Henry Ellen Basin, 10,000 acres of which surround their Margaret operations, which are mining the Harkness seam, the bottom workable coal of the Cahaba measures. These mines, three in number, opened in 1906, produce 2500 tons per day. Their Acmar mine has about 2600 acres and was opened in 1911; it is working the Mammoth seam, which is about the middle of the Cahaba measures, and produces about 1800 tons per day. At their Acton mines, opened in 1907, they have 6000 acres. The Helena seam, one of the highest grade coals in the state, is mined; it is next to the top seam in the Cahaba measures, and production at the two mines is 1000 tons a day. Large holdings in the Water-Works and the Scottsville basins are, as yet, undeveloped.

In addition they own 2500 acres of red-ore land in Shade's Valley, across Red Mountain from Birmingham, which are also undeveloped, but which test borings show to be underlaid with 8½ to 9 ft. of self-fluxing ore, carry-

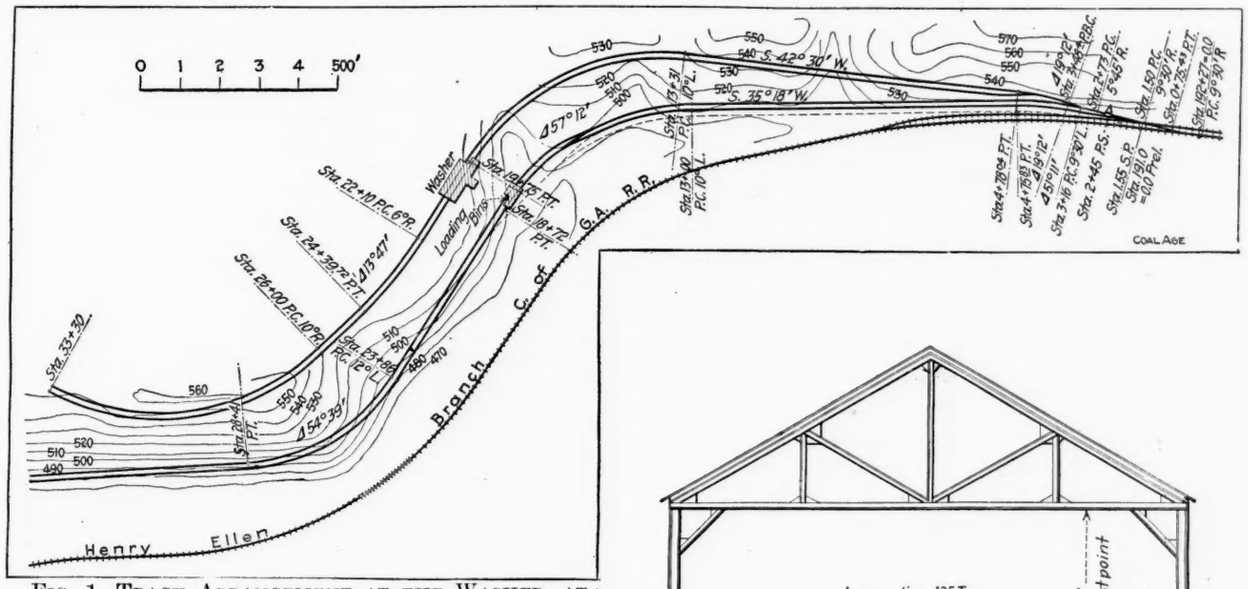


FIG. 1. TRACK ARRANGEMENT AT THE WASHER, AT COLGATE

*1026 Glen Iris Ave., Birmingham, Ala.

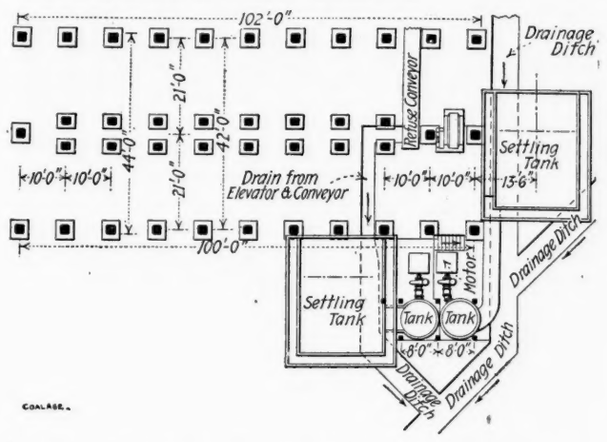


FIG. 2. GENERAL FOUNDATION PLAN OF WASHER

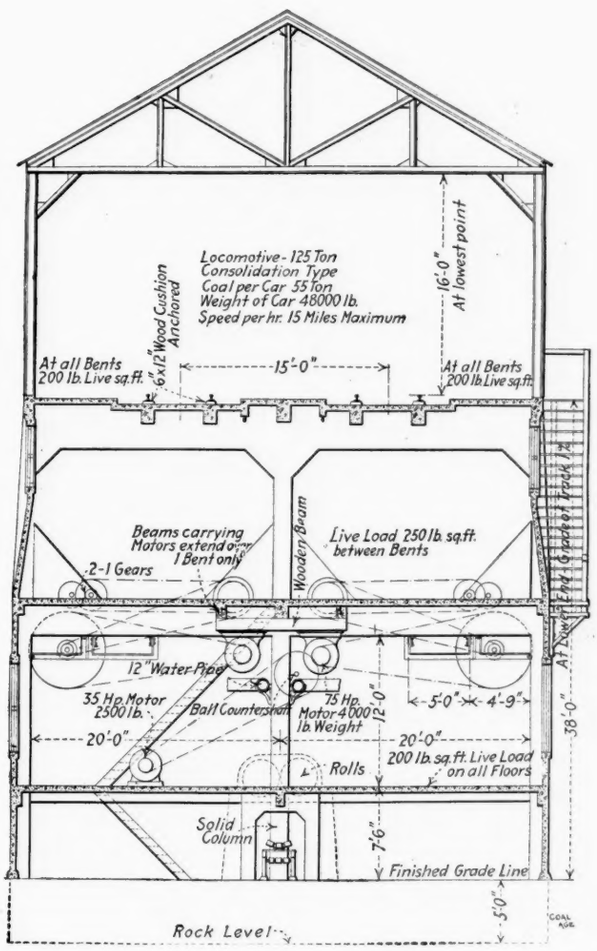


FIG. 3. IDEAL CROSS-SECTION OF WASHER

ing 36 to 38 per cent. metallic iron, and 2500 acres of brown-ore land in Franklin County.

All the operations, including the central washer, are on the Central of Georgia Ry., except the Acton mines, which are on the Louisville & Nashville R.R. The officers of the company are J. M. Overton, president, Nashville, Tenn.; Charles F. DeBardelaben, vice-president and general manager; Overton Fullton, secretary and treasurer, Birmingham, Ala., and I. C. Delony, general superintendent, Margaret, Alabama.

The coal at all the operations is screened over shaking screens with 4-in. perforations, the lump being hand-picked after passing over the screens. What passes through the 4-in. screen in carried over a 2-in. screen, the nut and slack being loaded and washed separately, after which they are again mixed; that at Acton is washed at a small local washer, and that from the Margaret and Acmar mines is sent to the central washer for treatment.

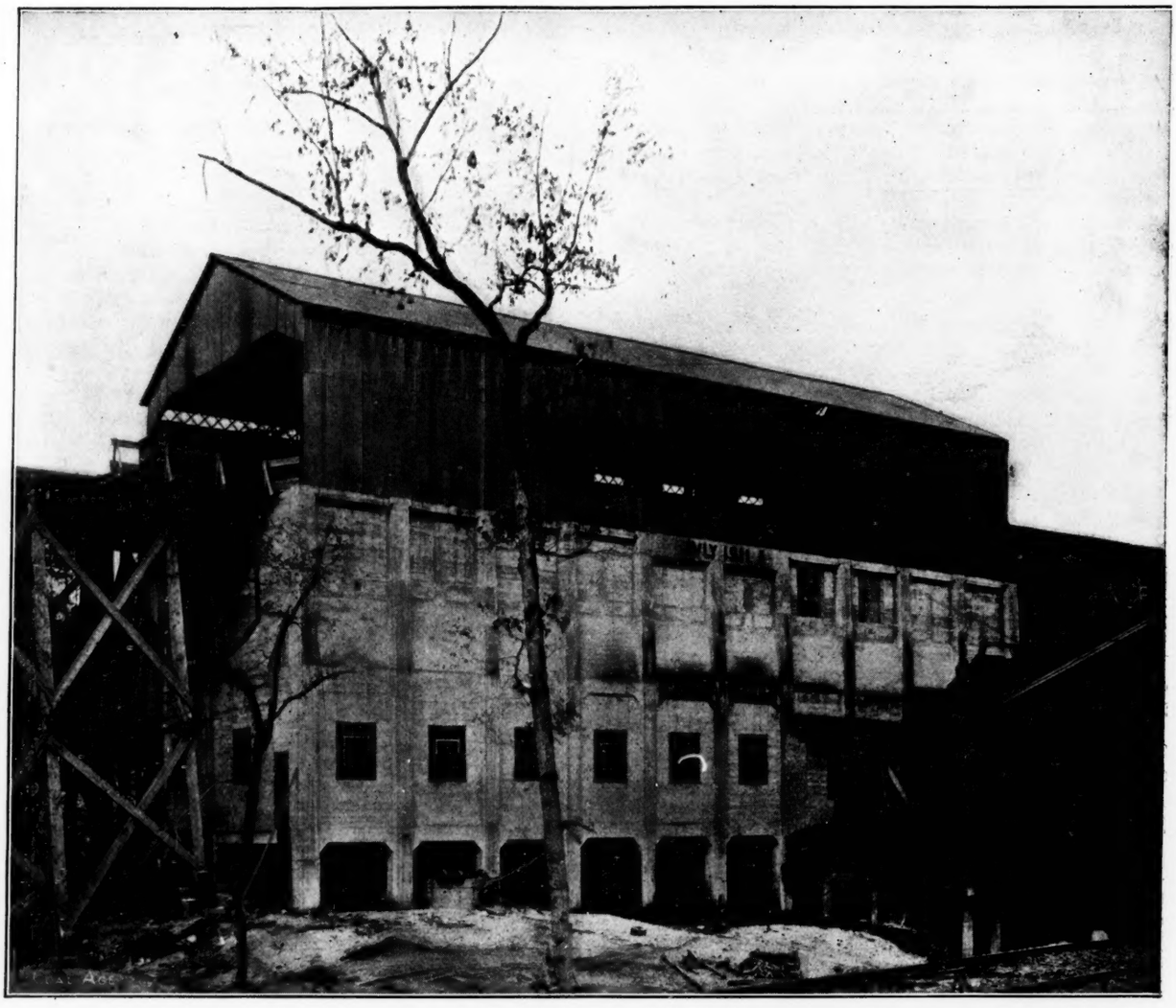


FIG. 4. COMPLETE VIEW OF THE WASHER, LOOKING NORTH, SHOWING TRESTLE

THE CENTRAL COAL WASHER

This washer is located at Colgate station, 2½ miles from the Acmar mine and 7 miles from the Margaret mines, from which points coal is shipped to it for washing. It was built in 1911 by the American Concentrator Co. The main washer building, bins and tanks are of reinforced concrete, except the shed over the unloading platform, which is a steel frame covered with corrugated iron, and the belt galleries and shed over the washed-coal bins which are frame.

The map, Fig. 1, shows the general track arrangement at the washer, all cars being handled altogether by gravity. The loaded cars from the mines are placed at the south end of the tracks, the coal from the Margaret mines on one track and that from Acmar mine on the other. The loads are dropped over the bins and unloaded, after which the empties run to the switchback at the point marked *A* on the map, and thence under the washed-coal loading bins; after being loaded there, they run to the storage yard ready to be removed by the railroad company. The coal from the two operations is kept separate throughout. The photograph, Fig. 4, of the complete plant, looking north, shows on the left the loaded-car trestle approach to the washer. On the extreme right is shown the empty cars leaving the washer, below which are other empties which, having passed through the switchback, are approaching the washed-coal bin, the building on the right. Between it and the washer

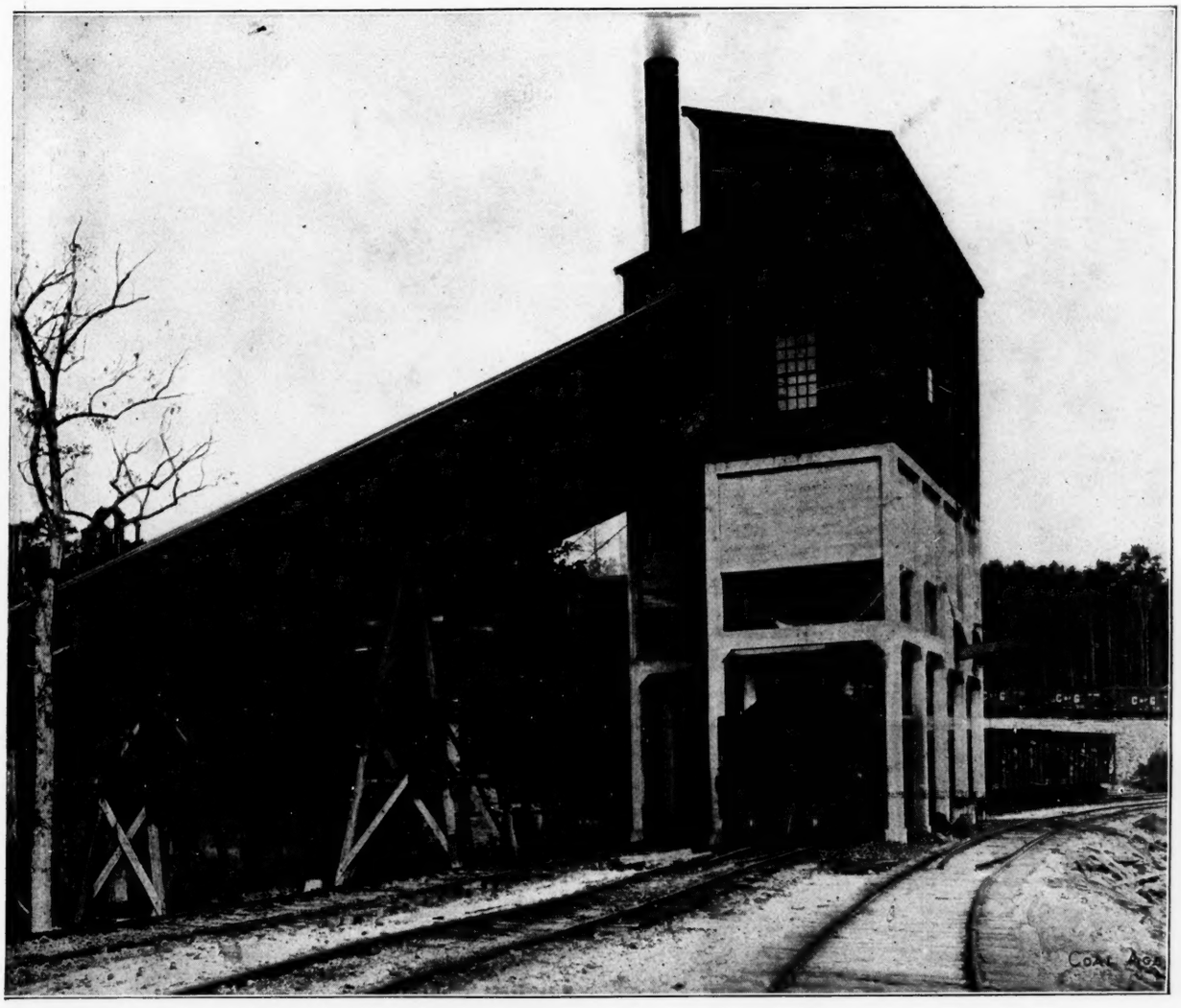
building are shown the two washed-coal inclined belt conveyors.

A foundation plan of the washer is given in Fig. 2. This shows the supports for the columns carrying the jigs and bins, also the location of the refuse conveyor, settling tanks, water tanks and circulating pumps. The refuse is carried to the conveyor by another cross belt conveyor between the two center rows of supports. These two rows of supports are arched together just below the jig floor line supporting one row of pillars from there up. A cross-section of the washer is given in Fig. 3, and Fig. 5 is a view of the jig floor taken before the curtain walls were put in, showing jigs, line shaft and sprocket drives for refuse elevators. It will be seen from these that there are two sets of tracks, jigs, settling tanks and washed-coal elevators, so that the treatment and loading of the coal from each of the two operations is kept entirely separate.

By referring again to Fig. 4, it will be seen that the main washer building consists of four floors, the top or corrugated-iron section being the raw-coal dumping floor, where eight cars (three of each kind of slack and two of each kind of nut) can be dumped at one time, four cars on each track. Under this are the bins, eight in number, four under each track, three for slack and one for nut; these were figured for 100 tons capacity each, but will actually hold 150 tons. Directly under the bins is the jig floor, and under this are the washed-coal sluiceways and refuse cross-conveyor belt. On the jig floor are the two rows of jigs, 10 on each side, six for slack 2-in. and under, and four for nut from 2 in. to 4 in. in size, the capacity of the whole being intended for 250 tons per hour, though they have washed 3500 tons in a 10-hour day.

The coal is dropped directly to the top of the jigs through round pipes or feeders. From the jigs it is sluiced, nut and slack together, to the two settling tanks from which it is lifted by short perforated bucket elevators and discharged onto two 24-in. inclined-belt conveyors, 190 and 220 ft. long, respectively, which discharge into the washed-coal bins.

The jigs are arranged in pairs and the refuse discharged by automatic slate gates which drop it into bins or tanks under each pair of jigs. From there it is lifted by short bucket elevators, one for each pair of jigs, and discharged onto the cross-horizontal belt conveyor running under the floor and from which it is discharged onto the final refuse 22-in. belt conveyor 1050 ft. run-



APPROACH ON LEFT AND TWO ELEVATORS TO WASHED-COAL STORAGE BIN ON RIGHT

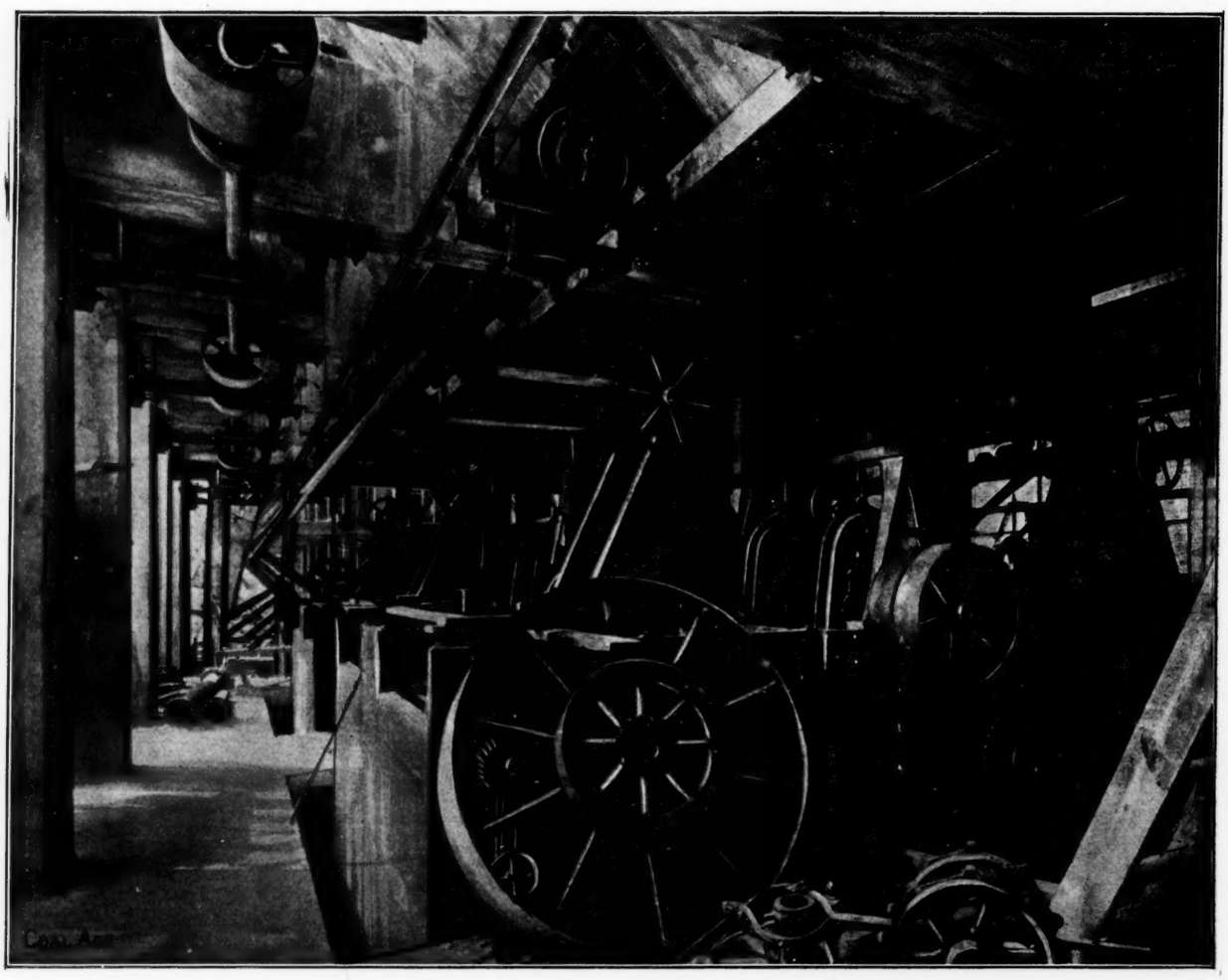


FIG. 5. JIG FLOOR, SHOWING JIGS, LINE SHAFT AND SPROCKET DRIVES FOR REFUSE ELEVATORS.—NOTE THE SUBSTANTIAL CONCRETE AND STEEL CONSTRUCTION OF THE MAIN BUILDING

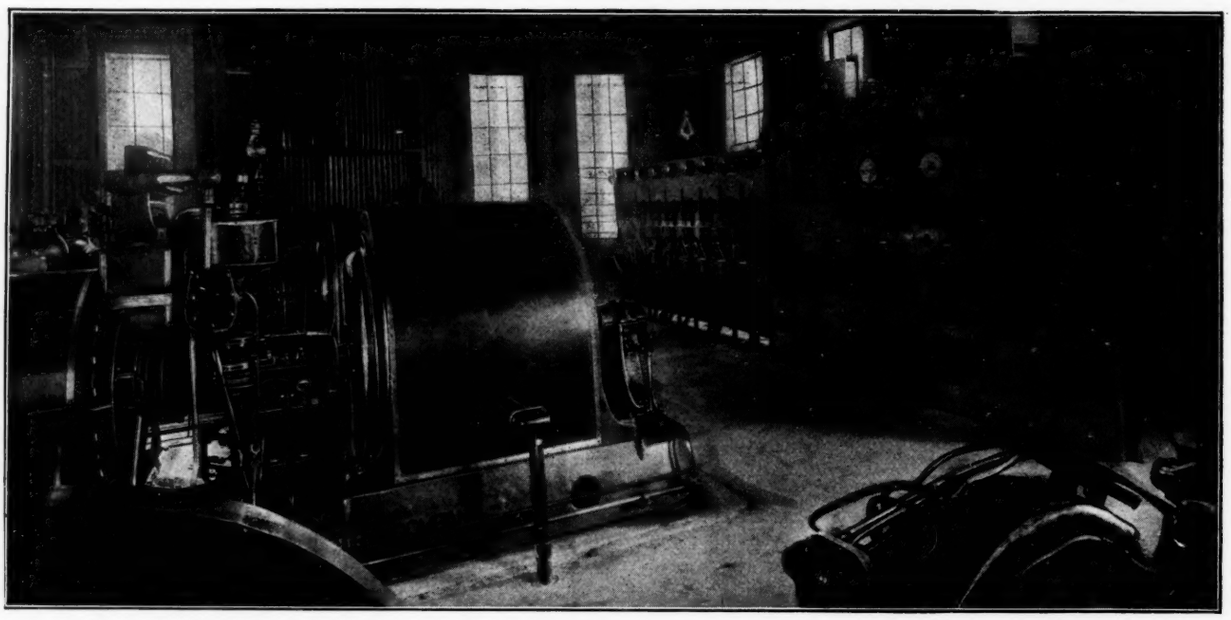


FIG. 6. INTERIOR OF POWER HOUSE, SHOWING SWITCHBOARD, ONE GENERATOR AND EXCITER. THE BUILDING IS WELL LIGHTED AND HAS CONCRETE FLOOR

ning at a slight elevation, which discharges over a ridge west of the washer where it is washed down the hill. A photograph of this last mentioned conveyor is shown in Fig. 7.

The water is pumped from Black Creek by an Alberger, single-stage, centrifugal pump through the condenser to a well or cistern. From here it is picked up by two De Laval single-stage centrifugal pumps, running at 1800 r.p.m., driven by 35-hp. General Electric induction motors, and having a capacity of 2300 gal. per minute.

The boiler plant consists of two batteries, each of two Sterling water-tube boilers, the total rated horsepower being 1000. These run two General Electric, turbine-driven, horizontal, 500-kw., 3-phase, 60-cycle, 2300-volt A.C. generators, which supply power for the whole washing plant, as well as the pumping and ventilating at the

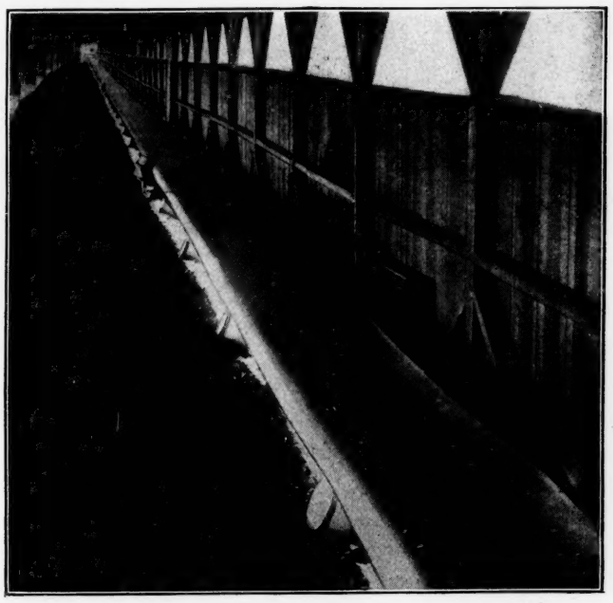


FIG. 7. A 22-IN. BELT CONVEYOR 1050 FT. LONG

Acmar and Margaret mines; they will also furnish power for hoisting at the Margaret mines, where they are now installing a General Electric, 350-hp., 2300-volt, water rheostat, induction-motor gear, connected to the drum-shaft by cut-steel herring-bone gears.

An interior of the power house, showing switchboard, one generator and one exciter is shown in Fig. 6. The power for operating the jigs is furnished by two General Electric, 75-hp., 900-r.p.m., 2300-volt, induction motors, belt-connected, by toggle-clutch pullies to the two line shafts. Each jig is belted through tight and loose pullies to the line shaft, so that any one jig can be cut out at any time without disturbing any other operations. The washed-coal elevators are driven by cut-steel sprockets from the line shafts. The refuse conveyor is driven 400 ft. per minute by a General Electric, 25-hp. induction motor. The speed of the washed-coal conveyor is 450 ft. per minute.

The American concentrator type of jig consists of a fine mesh, stationary screen over the front half of the jig tank with a square wooden plunger which acts as a valve, the water being introduced on the upper side and drawn into the tank on the up stroke. This type of plunger was unsatisfactory, being difficult to keep in repair and the maintenance cost was also high. Hence a cast-iron circular plunger was designed especially for the work, with eccentrics running in oil, the oil casing being of cast iron bolted to the top of the plunger. Detail of this plunger is shown in Fig. 8. This plunger is giving excellent results, the wear being almost entirely eliminated.

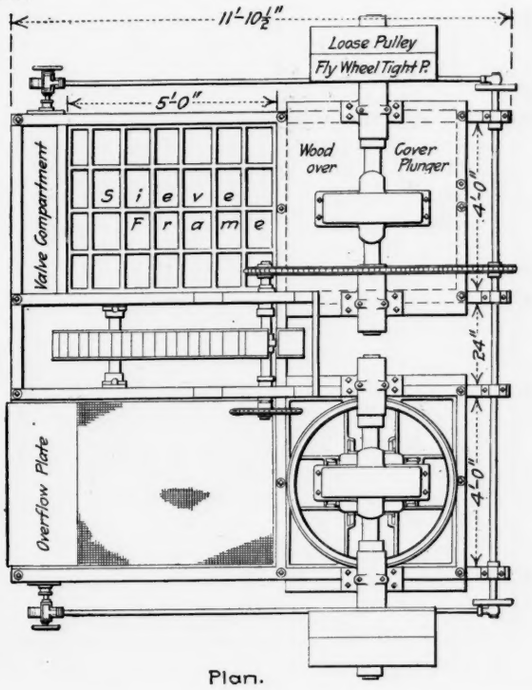


FIG. 8. PLAN AND SECTION OF JIGS

A crusher and rewashing jig with independent motor drive were provided for rewashing the refuse to save the fine coal lost in the primary washing, but the refuse is only 5 per cent. good coal and the rewashing of the refuse was abandoned, not being considered worth the cost and annoyance it entailed.

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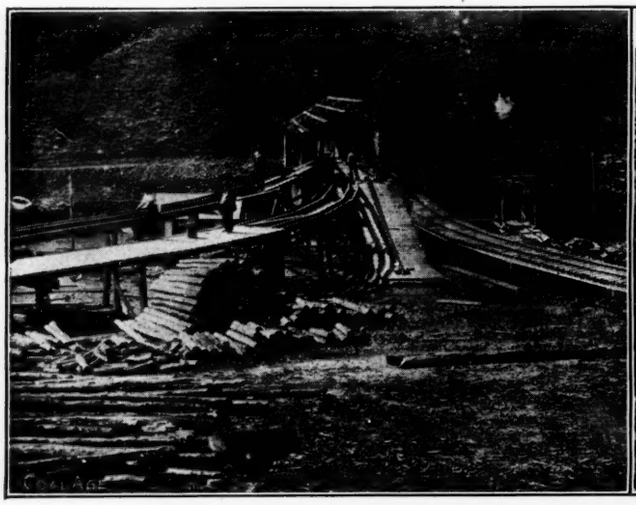
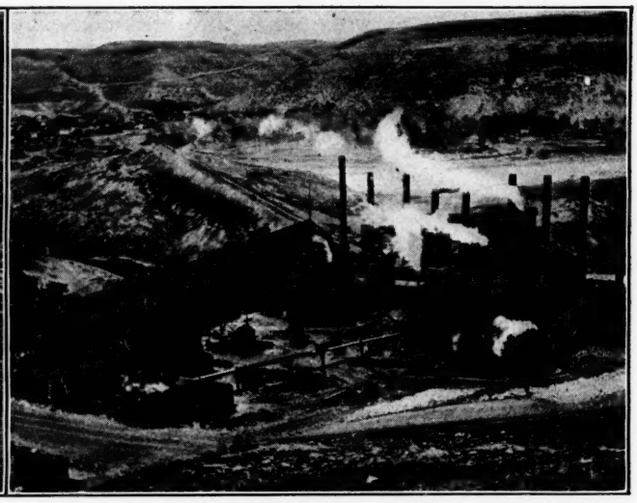
The custom of whitewashing the surface of loaded coal wagons has been inaugurated in Germany as a security against coal pilfering during transportation. Where the experiment has been tried it is said to have been successful.

SNAP SHOTS IN COAL MINING



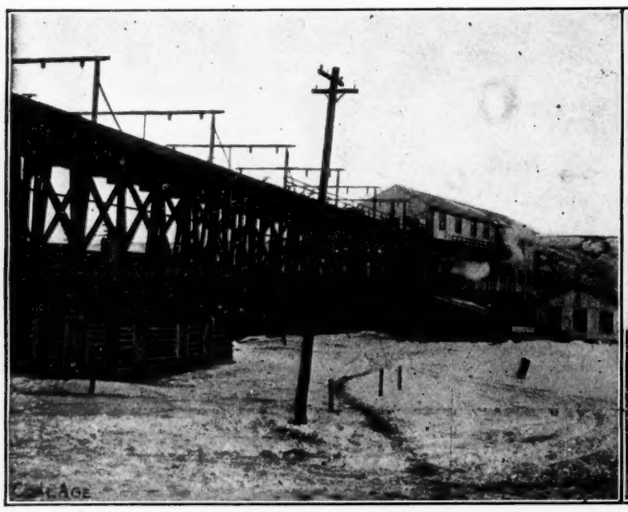
MONTANA COAL & IRON CO.'S MINE, IN BEAR CREEK FIELD



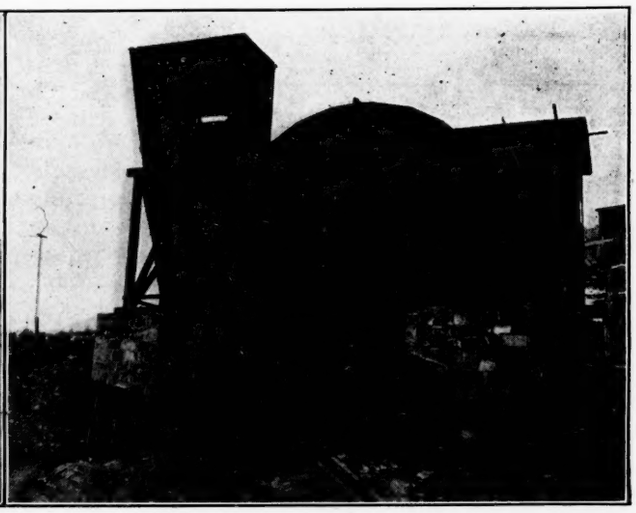
THE ANACONDA COPPER MINING CO.'S COAL MINE, AT BELT, MONT.

TIPPLE, COKE OVENS AND COAL BREAKER, ELKINS COAL & COKE CO., BRETZ, W. VA.

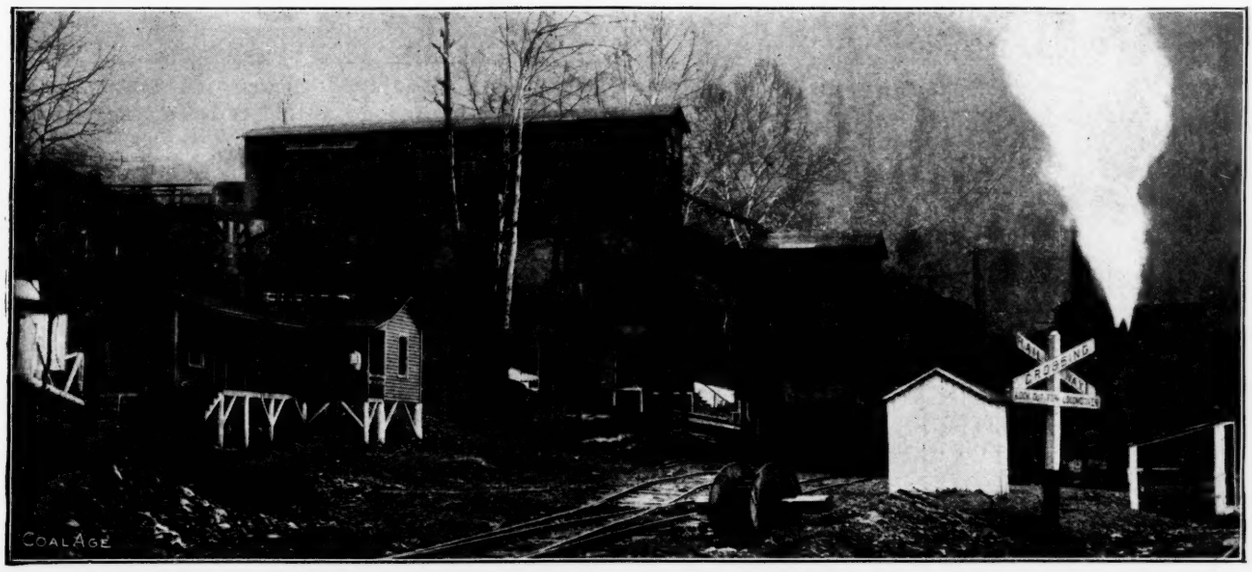
ANOTHER VIEW OF THE ELKINS COAL & COKE CO.'S BEEHIVE OVENS AT THEIR BRETZ PLANT



NORTHWESTERN IMPROVEMENT CO.'S TIPPLE, AT SUNSET MINE, RED LODGE, MONT. ALSO SHOWS HIGH TIPPLE APPROACH

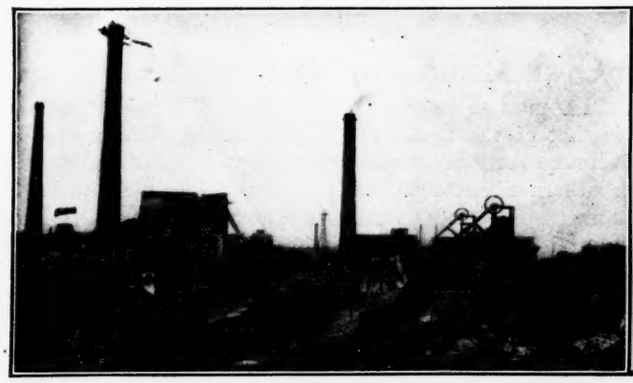


MINE FAN AT NO. 1 PLANT OF DIAMOND COAL & COKE CO., DIAMONDVILLE, WYO. AN OLD-TIME INSTALLATION

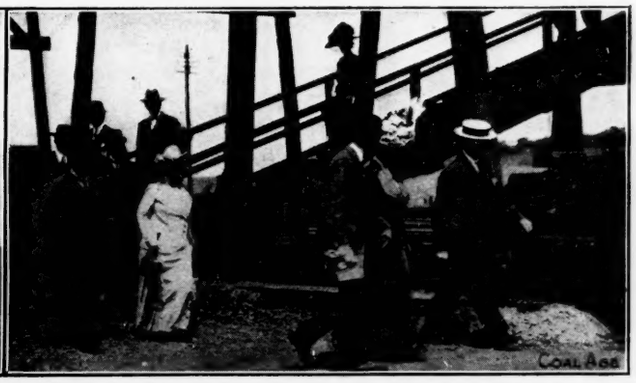


TIPPLE AND POWER HOUSE, CLEAR FORK COAL CO., JARROLDS VALLEY, W. VA.

British Sovereigns Visit English Colliery



GENERAL VIEW OF DALTON MAIN COLLIERIES



QUEEN MARY INSPECTS THE PLANT

THE QUEEN RIDES ON HAND CAR

KING GEORGE VIEWING MEMORIAL

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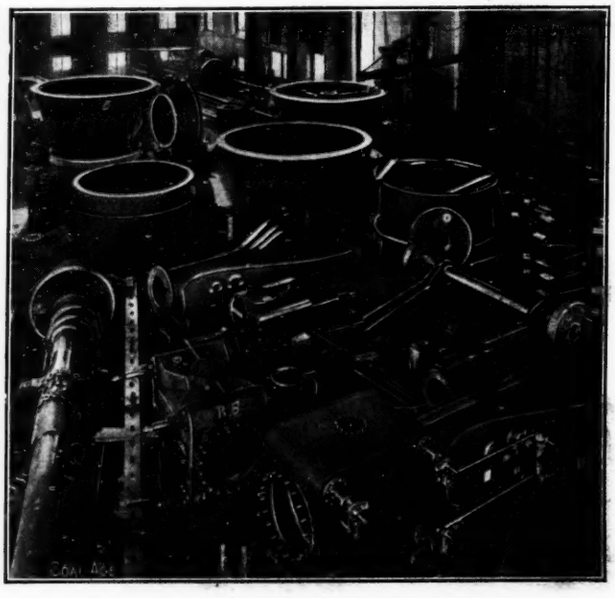
A Large Steam Mine Hoist

By L. F. Mitten

SYNOPSIS—The drums of this machine are conical, 10 to 14 ft. in diameter and 8 ft. long, weighing 40 tons each. The valve gear is so arranged that the engines may be started on the throttle, but when up to speed, the steam is used expansively.

The Delaware, Lackawanna & Western R.R. Co., coal-mining department, is now installing at the Loomis colliery, Plymouth, Penn., two pairs of 34x48-in. first-motion, link-reversing, heavy-duty, Corliss-type hoisting engines, which were built by the Vulcan Iron Works, of Wilkes-Barre, Penn. Engines of this kind are, to a certain extent, an innovation in the anthracite region, and a description of them will, no doubt, be of general interest.



Hoist on Assembling Floor. Note Man beside Hoisting Drum

The engines are equipped with two conical drums, each tapering from 14 ft. to 10 ft. in diameter, and are spirally grooved for 1½-in. wire rope. One drum is securely keyed to the engine shaft, while the other is brass bushed and driven by a toothed clutch-wheel, to allow for changing for different levels. The engines are reversed by an independent steam cylinder, while the brakes on each drum are also operated by this same type of mechanism.

In addition to the steam brakes auxiliary hand brakes are provided. The engines are equipped with tail crossheads provided with guards. Sheet-steel crank or splash shields are also furnished, which cover entirely the crank disk.

The arrangement of throttles is also different from the general practice as followed in the coal regions. On top of each cylinder is placed a vertical throttle-valve, surmounted by a steam separator. These valves are operated simultaneously by a cross shaft.

In the overhead steam pipe is mounted an auxiliary throttle, which is used in emergency. The valve motion is of full Corliss type, provided with dash pots. The cylinders are fitted with Vulcan improved releasing-valve gear. The actuating forces of the catches are a combination of hand-adjusted springs and gravity. The trips or releasing motion instead of being controlled by the ordinary type of Corliss governor, are operated from the throttle lever.

The first two or three revolutions of the engines are with a long cutoff, the throttle being only partially opened. A complete advance of the throttle lever, after the engines have gotten up to their full speed, throws into gear the trip motion, and the engines use steam expansively for the balance of the hoist. The cylinders are also fitted with a bypass arrangement, allowing the engineer to lower a load under compression. A foot treadle is conveniently located for this service.

These engines are to handle 100 cars per hour in a vertical shaft. Each hoist will be used for raising coal from lower levels up into the tower by means of self-dumping cages. The maximum depth of shaft at present is 900 ft., but this will ultimately be increased to about 1575 ft. The cages weigh approximately 13,000 lb. each, the empty car 3000 lb. and the coal 8000 lb.

We illustrate the conical drums that are used on these engines. As previously stated, they are 10 ft. to 14 ft. in diameter, and have a face of about 8 ft. Some idea as to their size can be formed by comparison with the man who stands alongside. Each section of these drums, together with its spider, weighs approximately 40 tons.

Coal Mining in Southern Shantung

The most successful coal mine in all Shantung Province is that of the Shangtung Chung Hsing Mining Co., a Chinese concern operating in the vicinity of Yi-Hsien, southern Shantung. In fact, these mines seem to have been the only ones operated in Shantung at a profit. The capital of this concern is $2,450,000 gold. The company is operating eight shafts and has just equipped its newest operation with modern machinery.

The machinery for this mine was supplied entirely by German manufacturers, who advanced a loan of 80,000 marks (about $19,000) to the company in connection with the installation of the machinery. The plant includes 10 boilers, pumps, elevators, electric machinery and cars. The company operates 27 miles of railway in connection with the mine, and for the construction and equipment of this railway German capital and materials were used.

Previous to the construction of the Tientsin-Pukow Ry., the company's products were shipped via the Grand Canal, but now practically all of its coal is shipped over this railroad. The company states that shipping over the canal costs 3c. Mexican a ton-mile, while shipping over the railroad costs but 2c. The coal, which sells at the mine for $2.25 gold a ton, is a first-class bituminous.

The chief engineer and the first assistant of this company are Cantonese who were trained at Tong Shan in Chihli. They have had no foreign assistance in the construction and operation of the company's plant. The chief engineer receivers $120 gold a month and his assistant one-half this sum. All of the labor in the mine is on a contract basis, the native miner making an average daily wage of about 10c. gold. There are about 800 men employed on the company's premises.

Compressed Air Trouble in English Mine

By Frank Richards*

SYNOPSIS—Extracts from a recent letter describing, briefly, trouble experienced in transmitting power by compressed air long distances, in an English coal mine. Pressure drop quoted as being 80 per cent. The situation carefully analyzed on assumed conditions. The importance of high initial pressure and ample pipe capacity clearly demonstrated. The pipe capacity does not increase in the same ratio as the diameter of the pipe. Large pressure drop may be economical in certain work. It does not always indicate loss of power.

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I am pleased to lay before the readers of Coal Age the essential portions of an interesting letter recently received from the manager of a large English coal mine. The writer says:

> We have at this colliery a large compressed-air installation. The compressor consists of a cross-compound condensing steam engine and a two-stage air compressor with a capacity of 9000 cu.ft. of free air per minute. We have about 13 miles of pipe, which comprises two mains, each 4 miles long; two mains, each 2 miles long; and various lengths of tappings, making a total of about 13 miles.
>
> The air pressure, at the compressor situated on the surface, is 52 lb. gage, while at the two ends of the 4-mile mains (especially in the winter time, or in cold weather), the pressure varies from 10 to 14 lb. gage, which shows a loss of from 73 to 80 per cent. As the entire colliery depends on compressed air for driving the hauling engines and pumps (not coal cutters), this great loss is an important item. If you can suggest a way to reduce this loss of power it will be welcome information.
>
> The shaft is 1690 ft. deep. Would covering the pipes leading down the shaft, with some nonconducting material, such as boiler covering, be of any use? The temperature of the air leaving the compressor is 250 deg. and at the shaft bottom it is only 90 deg. F.

A Suggested Analysis

In answer to the question asked in this letter, allow me to say nothing could be gained by covering the pipes. When air is transmitted to such distances, it invariably attains, more or less closely, the temperature of the surroundings. This is quite plainly the case here where the temperature of the air, in going only a third of a mile or so down the shaft, has fallen 160 deg. F.

It would seem, at once, that this is a case of too low initial pressure, very common in English mining practice, and an insufficient pipe capacity. It is much to be regretted that no information is given regarding the size of the pipes, which is a most important particular.

In the absence of any statement to the contrary, we may assume, at first, that the pipes are without leakage, which may or may not be the case. Air pipes with proper attention are less likely to leak than steam pipes; but often they do leak more, because the air leak does not sizzle and drip and compel attention, as do steam leaks. That air-pipe lines may be made tight is attested by the many long pipe lines in use and kept at full pressure in switch and signal service; and by the many-jointed and valved air-brake pipes, in service on trains.

We would, in the present case, shut off everything, at the extremities of the lines or wherever the air is used; and pump up to maximum pressure, at the compressor; and observe how this pressure holds. If the pressure continuously drops there are, of course, leaks and these must be found and stopped. If the pipe is properly laid at first, there should be no leaks and none are likely to develop later. But leaks, however small, will grow bigger and become more and more difficult to stop. It is unfortunate for anyone who has to do with compressed air to assume that leaks are a legitimate part of the game. On the contrary, they show a poor installation.

Pipe Capacities

The Johnson formula, for the flow of air in pipes, which is quite generally used, for sea level, with a slight change of the constant, is as follows:

$$p_1^2 - p_2^2 = \frac{V^2 l}{2000\, d^5} \qquad (A)$$

Here, V is the volume of free air, in cubic feet per minute; l is the length of pipe, in feet; d the diameter of the pipe, in inches; p_1 the initial absolute pressure (gage pressure + 14.7, for sea level); and p_2 terminal absolute pressure.

The formula (A) may be transformed as follows, according to the purpose for which it may be used:

$$l = \frac{2000\, d^5\, (p_1^2 - p_2^2)}{V^2} \qquad (B)$$

$$V = \sqrt{\frac{2000\, d^5\, (p_1^2 - p_2^2)}{l}} \qquad (C)$$

$$d = \sqrt[5]{\frac{V^2 l}{2000\, (p_1^2 - p_2^2)}} \qquad (D)$$

In the case before us, the absolute pressure, at the compressor, is 52 + 14.7 = 66.7 lb. per sq.in.; and the pressure at the end is, say 14 + 14.7 = 28.7 lb. per sq.in., the difference or drop being 66.7 — 28.7 = 38 lb. This terminal pressure, by the way, is 43 per cent. of the initial pressure, and the percentage of pressure "loss" is only 57, instead of 80 per cent., as stated.

We are told that there are two 4-mile lines; and we may assume that each transmits about one-half of the air, so as to enable us to estimate the possible conditions. Say, then, that we have a 9-in. pipe (which we are aware is not a common commercial size), 4 miles long, transmitting, say 4500 cu.ft. of free air per minute, at the initial pressure of 66.7 lb. absolute.

By formula A, we have,

$$p_1^2 - p_2^2 = \frac{4500^2 \times 4 \times 5280}{2000 \times 9^5} = 3621$$

which gives the difference between the squares of the initial and terminal absolute pressures. But, $66.7^2 = 4449$, and $4449 - 3621 = 828$; and $\sqrt{828} = 28.7$, which is, therefore, the terminal absolute pressure. This shows a drop of 66.7 — 28.7 = 38 lb.

Noting the above result, obtained from formula A, taking the initial pressure at 52 lb. gage; let us now assume that the initial pressure was, say 100 lb. gage, or 100 + 14.7 = 114.7 absolute; and observe the difference. Now, since $114.7^2 = 13{,}156$, we have $13{,}156 - 3621 = 9535$; and $\sqrt{9535} = 97.65$, which is then the terminal absolute pressure. The pressure drop in this case is 114.7 — 97.65 = say 17 lb.

*Ingersoll-Rand Co., New York City.

This shows clearly what an increase of initial pressure will do toward reducing the pressure drop, in transmission. Without giving further figures, it may be stated that if, in the last case, the pipe had been 10 instead of 9 in. in diameter, the theoretical terminal absolute pressure would have been 105 instead of 97.65 lb., and the drop would then be only 114.7 — 105 = 9.7 lb. Thus, by adopting a suitable diameter of pipe the pressure drop, in transmission, may be whatever we choose.

Relative Capacities of Small Pipes

In many installations where the *mains* are of sufficient size, there is still a considerable final drop of pressure in branches and extensions that are too small. It is not sufficient to have the sum of the sectional areas of the smaller pipes equal to that of the main pipe that supplies them. The pipe areas are, of course, directly as the squares of the diameters. For example, a 2-in. pipe has one-fourth the area of a 4-in. pipe; but, for the same pressure drop, four 2-in. pipes, though having the same total area, will transmit much less air than the single 4-in. pipe, because of the greater rubbing surface of the former. If the four 2-in. pipes were required to transmit the same quantity of air, per unit of time, the pressure drop would have to be much greater.

It has been found, in practice, that the square root of the fifth power of the diameter approximates the relation of pipe capacities for delivering air. For example, as stated previously, a pipe of one-half the diameter of another has only one-fourth the area of the larger pipe; but it will not transmit one-fourth as much air, under the same pressure drop. For the same pressure drop, the ratio of air volume, in this case, will be

$$\frac{V_1}{V_2} = \sqrt{\left(\frac{1}{2}\right)^5} = \sqrt{\frac{1}{32}} = \sqrt{0.03125} = 0.176$$

Then, to transmit the same volume of free air, under the same drop of pressure, will require $\frac{1}{0.176} = 5.65$ of the smaller pipes. Or, say a pipe of twice the diameter of another will transmit 5.65 times the volume of air, with the same pressure drop, for any given distance and initial pressure. This difference becomes greater as the difference in pipe diameters increases. A pipe of only one-fourth the diameter of another will transmit not $\frac{1}{16}$, but $\sqrt{\left(\frac{1}{4}\right)^5} = \frac{1}{32}$ of the air volume, for the same initial pressure, pressure drop and distance.

Air Saved by Pressure Loss

It must not be supposed, however, that this drop of pressure, in transmission, always, means a loss of power. That will depend on the way in which the air is used in doing its work, after transmission. There might be cases where the pressure drop outlined in the above letter would mean a gain in actual power or a saving in air consumption, rather than the reverse; and, in that case, the loss of pressure mentioned might prove to be the most economical feature of the proposition.

The wasteful habit of the ordinary steam pump when driven by compressed air is notorious. Not only is the air used without cutoff for expansion while doing its work, and there are excessive clearances to fill; but, at the end of the stroke, the entire cylinder will fill with air at a pressure perhaps considerably above the required working pressure, equalizing the pressure in the pipe line. The greater this excess of pipe pressure, therefore, over that required for the pump, the greater will be the loss of air.

It is always desirable to transmit air at high pressures, for the sake of pipe-line cost, if long distances are to be traversed. While the air is at a high pressure, the opportunity is presented for draining the air, so that the later freezing of exhausts must be minimized. If the air is to be used at high pressure, as usually it should be, it ought to be used expansively and reheated, if possible. The various types of rock drills now in use call for pressures approximating 100 lb. gage, in order to develop the highest efficiency in the drills.

The indications are that, in the above colliery, the pumps and the haulage apparatus mentioned would be amply supplied, so far as pressure is concerned, if a 20-lb. pressure could be maintained. If the air were to be used at that pressure but reached the work, at a pressure considerably higher; pressure reducers should be employed at that point; and after reducing the pressure, the air should be reheated as near to the work as possible. In this case, the pipe line mentioned serves as a pressure reducer; but it seems to overdo the business. It is also, to a certain extent, a reheater; as the air, notwithstanding the drop in pressure, will generally reach the point where the work is to be performed, at a temperature close to that of its surroundings.

We may say that the case in hand is a bad one and cannot be improved without redesigning and reconstructing the entire system, the cost of which would probably be prohibitive. Leaks should be sought and stopped. With two-stage compression, the delivery pressure should approximate 100 lb. gage, or, say, at least, not less than 80 lb. gage. In the present case, however, this would prove of little advantage, unless arrangements were made to use the air economically. It seems quite evident that the "loss" of pressure, in transmission, in this colliery, is only an item that is by no means the chief element of inefficiency.

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Survey Spads

For a number of years the standard spad for underground surveying was a horseshoe nail with the head flattened and punched or slotted to receive the plumb-bob cord. The *Engineering and Mining Journal* states that a few years ago, a substitute was proposed consisting of a wire nail with a triangular file-cut halfway through the rim of the head, the nail being inclined when driven, so as to bring the notch on the upper edge of the head. Considerable experience with both types has brought out the following points:

(1) The wire nail is stronger and better resists chance blows or blasting, if set near the face.

(2) It is cheaper and easier to make.

(3) It makes the plumb-bob easier to hang in the first place, but slower to adjust for height.

(4) It is more accurate. Any one size of plumb-bob cord can occupy but one position, whereas in a hole the cord can climb the side and be off-center by a small fraction of an inch.

(5) It is not suitable when it must be set in a position difficult to reach. In such cases, it is customary, with the old-style spad, to hang a permanent loop of cord down to a point within easy access. This is not possible with the wire nail.

The Gas and Oil Well Problem

By R. Dawson Hall

SYNOPSIS—The Bureau of Mines called a conference of those interested in the drilling of gas and oil wells through coal beds. The Federal authorities opened the discussion but did not try to influence the decision of the meeting. However they presented some extremely helpful suggestions.

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It was my amiable intention to praise the admirable suggestions made by the engineers of the Bureau of Mines in relation to the protection of mines from gas and oil wells. Unfortunately, I was enjoined to say that the Bureau really had no suggestions, nor even any working hypotheses; that all which was said at the Pittsburgh conference was intended simply as a quickener of interest to awaken discussion. It was darkly hinted that the Bureau secreted its judgment *"in petto,"* so to speak; everything was unauthorized and inchoate.

The Attitude of the Bureau

I confess that I could hardly credit that G. S. Rice and O. P. Hood did not really feel their solutions were the best which they could devise, and any attempt to shake their confidence in the cures suggested met with their spirited, though courteous dissent. It did not appear that they were presenting merely the consensus of ideas urged at the various ex-parte conferences. The suggestions did not seem a composite of jarring interests, but rather the personal preferences of those presenting them.

Naturally the Bureau does not desire to appear to be coercive and would not like to have its working hypotheses used as expert testimony in a court of law. Moreover there are only too many worthy people who desire to see a pallid, limp institution, rather than a Bureau of fearless initiative. In fact, in this country little is less free than our governmental bureaus.

The Representatives Present

The meeting was held in the auditorium of the Western Pennsylvania Society of Engineers in the Oliver Building, Pittsburgh, Penn., commencing Friday morning, Feb. 7 at 10 a.m. W. E. Fohl was made presiding officer and O. P. Wood, secretary. The meeting was not largely attended, but was fairly representative, and those present were of sufficient importance in their various fields to make their judgment felt widely. A few may be mentioned:

E. J. Taylor, Pittsburgh, Penn., chief engineer, Pittsburgh Coal Co.; W. C. Neill, Pittsburgh, Penn., attorney, Manufacturers Light & Heat Co.; F. W. DeWolf, Urbana, Ill., director State Geological Survey; Richard R. Hice, Beaver, Penn., state geologist; A. P. Cameron, Irwin, Penn., general superintendent, Westmoreland Coal Co.; A. C. Beeson, Pittsburgh, Penn., chief engineer, Wm. A. Weldin, Pittsburgh, Penn., assistant chief engineer, Pittsburgh-Buffalo Co.; B. H. Canon, Pittsburgh, Penn., United Coal Co.; George W. Schluederberg, Pittsburgh, Penn., general manager, Pittsburgh Coal Co.; A. J. Moorshead, St. Louis, Mo., president, Madison Coal Corporation, representing Illinois Coal Operators' Association; E. B. Moore, Fairmont, W. Va., chief engineer, Consolidation Coal Co.; John W. Boileau, Pittsburgh, Penn., coal operator, David Young, Freeport, Penn., state mine inspector, and George S. Rice, chief mining engineer; O. P. Hood, chief mechanical engineer; H. M. Wilson, engineer in charge, and Irving C. Allen, petroleum chemist, all of the United State Bureau of Mines, Pittsburgh, Penn.

A paper was read by G. S. Rice entitled "Gas and Oil Wells in Coal Fields." The most novel feature in this paper was its reference—I had almost said its "advocacy" of the withdrawal of coal around gas wells. But it did not arouse any discussion because neither this paper nor the one which followed, nor even the preamble of the third paper, was presented for criticism.

Why Leave Well Pillars?

The proposal that coal around wells should be extracted has some merit as a suggestion, but as presented it cannot be regarded as without serious objection. The parent of the idea—for Mr. Rice acknowledges that he suggested it—calls attention to the success with which pillars have been drawn around shafts by the longwall process both in England and America.

But I may be pardoned if I call attention to an essential difference in the plans presented. The workings around such shafts proceeded from the axis of the shaft as a center, but the illustration of Mr. Rice exhibited a well in a room from which the pillars were being extracted back toward the borehole. Thus the well lay in a piece of rock unsupported at one end. Even before fracture would take place, the borehole would be tilted out of plumb and a partial breakage of the rock might distort the hole so that gas or oil tubing would be broken.

Where Well Pillars Might Be Extracted

There is a method of action providing strains more closely analogous to those sustained by a pillarless shaft in longwall. A plan known as the "double-entry system" in America, and I believe as the "wicket" system in England consists of rooms driven from two headings to meet at the center line between them. A hole sunk on that center, line would be free from warping provided that the ribs were withdrawn to the right and left, beginning at the room where the hole was located.

The plan would be successful only where it is arranged that the borehole will be at the center of excavation at all times prior to final collapse. One cannot feel confident that even with careful scheming such a result could be attained, unless the privilege to drill were immensely restricted.

Even though the discussion did not take up this essential consideration on the ground that it formed no part of the proposed legislation, E. B. Moore, chief engineer of the Fairmont division of the Consolidation Coal Co., declared himself unchanged in his views on the importance of pillars.

To Fight Legislation with Legislation

A paper followed by L. M. Jones on "Some Troubles Experienced by Mines Resulting from Proximity to Gas and Oil Wells." This paper reviewed the unfortunate experiences which have already occurred. It can only be said that they justify the Bureau in taking up this subject. What do the stand-patters want? Are they anxious that the mining public wait and learn their lesson from a disaster of a magnitude equal to that at Monongah or Harwick, before any preventive action is taken?

A third paper by O. P. Hood and A. S. Heggem made

"Suggestions for Laws and Regulations in the Matter of Boreholes Passing Through Workable Seams of Coal." The actual draft of law with which that paper concluded was read clause by clause and criticized carefully till the close of the meeting shortly after noon on Saturday, the 8th.

The Attitude to the Proposed Department

Richard R. Hice opposed the suggested creation of any more departments in the various states. He thought there were already too many. O. P. Hood conceded that all the services of state geologist, mining and fuel-well inspector might be grouped under one and the same head. F. W. DeWolfe speaking for Illinois, regarded it well not to put the authority in the hands of the mine inspectors because many parts of his state, underlaid by unworked coal, were being drilled for gas and oil. The inspectors already appointed could not supervise these drillings. G. W. Schluederberg favored leaving the matter to the Department of Mines.

Discussing notification to parties interested before locating a borehole, it seemed generally conceded that a certain period of notice—a week or ten days—should be sufficient. In the event of the coal operator failing to arrange to be present or represented in that time, his absence should not act as a stay to prevent location and license. It was suggested that the mine owner, fuel-well inspector and mine inspector should not be the only persons notified, but that the lessor of the coal and of the oil right was entitled to a notification and hearing.

To Reduce Surveying Inaccuracies

It was asserted that the demand for an accurate survey was deficient in several points. It calls for a connection with two property lines. This gives an assurance that the meridian of the survey can be accurately determined if the corners of the property are obvious and undisputed, and if the survey is correct. But from experience, it is unlikely that either need will be fulfilled. Fuel-well surveying, with some noteworthy exceptions, is grievously inaccurate, and land lines are in nearly every case indeterminate.

Consequently, it was suggested that all surveys be made to connect with the U. S. Geological monuments, or with certain arbitrary monuments set in new fields in cases of "wildcatting." There is a strong objection to reliance on a survey connected by long lines from some distant monument, no matter how permanent it may be or how carefully recorded.

Essential, it seems to me, is a requirement that all surveys be carefully duplicated along separate lines, not only because a competent surveyor will thereby discover his error, but because a novice and ignorant practitioner can be unmasked infallibly by a careful traverse of his survey. A diligent traverser at headquarters working in dubious cases could make it extremely unpleasant for such a man and his employers.

Are Churn and Diamond Drill Holes a Menace?

Exception was taken, and I believe rightly, to the requirements that "any borehole drilled for gas, oil or other mineral shall be drilled at least 20 ft. below any workable seam of coal which may be penetrated," and be double cased and mudded and so forth. This would include churn and diamond drillings, and only for the inadequate reason that gas or oil might be struck.

Surely the gas and oil inspector ought to be the judge of the matter. It should not be required that such test holes be extended 20 ft. beyond their needed length. Water and elevator wells possibly should so extend to protect the pipe from breakage when mining reaches the well but test holes if immediately plugged and filled should be safe, and made free from all such unreasonable requirements.

The Clay Packing

The proposition advanced by G. S. Rice and O. P. Hood that above the workable coal and for a certain distance thereunder, two casings should be provided and the space between them filled with clay is as sane and sound a proposition as has yet been heard. Fault can be found with it but criticise it freely as you will, it is based on correct principles:

The scheme as outlined is probably insufficient; it is hard to place the clay and difficult to retain it in place; the plan has not been submitted to test and sufficient emphasis has not been laid on the ductility of the casing or of the tubes within the well, and the method involves a larger hole than has been hitherto provided. These are important objections it is true, but as an indication of the right lines for future progress, no better suggestions have so far been made.

Make no question but that all the specifications of all the coal companies have been worse than useless as have been the orders of the court. How can any number of casings laboriously placed and diligently concreted be expected to resist the movements of millions of tons of rock. Our final "caves" frequently involve not less than a million tons, and often five million tons tilt over in one body. Against this we oppose a miserable pipe stem incapable of upholding an axial load of a few hundred tons.

The Elastic Casing

It has always been marevelous that such a false protection received almost the unanimous approval of the coal-mining fraternity, and Mr. Hood is to be congratulated that he is leading what, at first sight, appears to be a forlorn hope against it. Yet his ideas are sure to succeed for nothing is more certain than that casings should be elastic.

What chance has a casing with its joints imbedded in concrete or cement mortar, with that material hanging doggedly to the roughnesses and recesses of the borehole, when the rock to which it thus adheres falls, subsides or take a tilt?

Surely none whatever, but if the pipe rested on supports from the surface or stood on the unyielding measures below, without restraint from the environing walls, it could be relied upon to slide up and down the hole as the movement of the measures rendered that motion necessary, provided always that the distortion of the hole did not suffice to bind the pipe.

It is true that the concrete has been provided to keep corrosive waters from destroying the casing. This it may do in some instances. As Mr. Hood pointed out, the rapidity of the corrosion is a function of the frequency with which the corrosive waters are replenished and cement mortar or concrete may well serve to reduce the frequency of that change, even when porous and filled with air holes.

Imperfections in Cement Mortar

But it is notoriously hard to keep airbubbles and resulting voids out of concrete, even when the material is deposited in large bulk and the air is given a vent by a shovel, a paddle or some form of tamping tool. In the depths of the well, the only hope is that the increased pressure will make the air bubbles smaller.

The quantity of air introduced with cement mortar in a deep well must be larger because as it falls down the annular space, the air has less chance of escape. It may be reduced in quantity by the use of a lowered pipe by which the mortar is conveyed in an almost continuous stream to the point of deposit. It is impossible to make this continuous, however, and some air must enter.

But there is probably a solution of this difficulty. The clay in the alternative clay filling could be ground somewhat coarsely so that there would be plenty of granular material for settlement. The pressure of the water in the hole would probably serve to make a complete fill.

Vented Pipe Lines

The suggestions presented by the bureau officials laid particular emphasis on the providing of a vent around the pipes. It was stated that it was customary to convey gas from sands of low pressure between the casing and the outermost gas tube. Should the gas traveling this pipe be closed off, a heavy gas pressure would soon result. This gas is likely to escape from the casing if that pipe should be corroded or torn apart. Of course a gas company might leave all manner of instructions forbidding the shutting off of the gas from the line without opening a vent to the surface but such instructions might well be forgotten or disobeyed.

The gas and oil men who showed all through the meeting a disposition which does them no little credit seemed at this point prepared for opposition. The representative of the gas interests near Fairmont, W. Va., stated that there were 11 sands making gas in that section. He said that this involved the placing of a great number of pipes in the well as the pressures from the different strata did not permit of the use of a single tube. He concluded by saying that the hole would be rendered so large, if a vent were provided, that a heavy burden would be put on the gas companies.

Mr. Hood answered his criticisms with much justice stating that perhaps the gas men demanded too much from one hole. If there are so many profitable sands, the necessary steps for their safe tapping should be provided and if it could not be done satisfactorily by one hole, two could be drilled in close proximity.

Plugging Abandoned Wells

The question of abandonment was warmly debated. It was thought by some of the coal men that it was impossible to plug a gas well satisfactorily if the rock pressure was extremely high. A well having a negligible gas flow may develop a rock pressure of 1000 or 1200 lb. per sq.in. Such a well is hard to plug even with lead.

As Mr. Hice pointed out, a lead plug, however tight, may fail to keep back the gas by reason of leakage through the strata as the plug cannot be made sufficiently long to prevent such by-passing of the gas. The consensus of opinion seemed to favor the idea that the method of plugging should be settled by the inspector.

(To be continued in the next issue)

The Bohunk

Written Expressly for Coal Age.

By Berton Braley

[In several coal-mining camps the term "bohunk" is applied to the men of any race, who live in herds, speak no English, and have no independence, no pride, no desire apparently, to be human beings. In short, the lowest class of European Labor is the Bohunk.]

We never loved the Bohunk an' I guess we never will,
He ain't the sort of person you kin cheer for,
He hasn't got no decency ner self respect, ner skill
An' a job at any price is what he's here for.
He lives in dirt an' squalor, sleepin' seven to a bed,
In a tumble-down old shack that was a cabin,
An' work an' sleep an' eatin' is the thoughts that fill his head,
While his favorite amusement is a stabbin'.

We do not love the bohunk,
We never liked his style,
He hasn't got no winnin' ways,
He don't know how to smile,
He often pays to git his job,
A fact that's plain for seein',
But we don't like the bohunk, for
He ain't a human bein'!

The husky guy from Tuscany is just as good as us,
The proper sort of Finn is all the candy,
An' the Frenchy an' the German an' the Spanish an' the Russ,
You take 'em as a rule an' they are dandy.
But the Bohunk is a dummy an' a rummy an' a clam,
He's a lowly beast of burden like a mule is,
An' I'd rather be a comrade of a native of Siam
Or the chum of any yellow brand of coolies.

We do not love the Bohunk,
Which doubtless is a sin,
It ain't the ugly face of him
Ner the color of his skin,
But he doesn't love his feller man
Ner yet his feller woman,
An' he ain't a decent animal
Ner yet a decent human!

The bohunk takes his money an' he sends it over sea,
He never goes an' spends it where he makes it,
He comes to get his wages in this country of the free,
An' when the land has paid him—why he shakes it!
An' though he joins the union, he's a crooked scab at heart,
There ain't a single soul he seems to care for,
I kin like a decent *nigger*—but I found out at the start
That the Bohunk I ain't any love to spare for!

We do not love the Bohunk,
No matter what his race,
We never want to shake his hand,
We want to break his face,
For when all is said an' spoken,
It is plain for any seein'
That the Bohunk may have feelin's,
But he ain't a human bein'!

CURRENT COAL LITERATURE

Motor Truck Coal Shoveler*

A mechanical shoveler mounted on a motor truck and suitable for loading coal at a storage pile is described in Glückauf, Dec. 14, 1912, by O. Dobbelstein, a mine assessor, of Essen, Germany. It is built by the Pohling Aktien Gesellschaft, of Cologne, Germany.

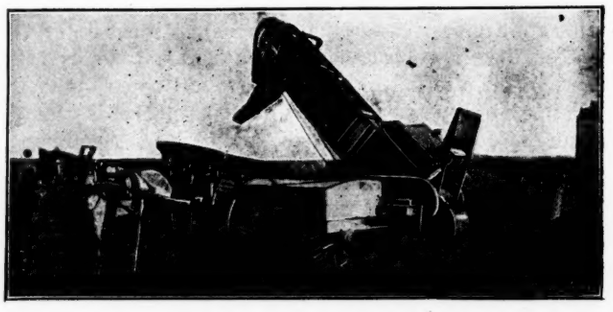
The shoveler is mounted on a strong platform truck having wheels of wide tread roughened as is customary for traction-motor service. The machine proper consists of an inclined bucket conveyor which is supplied with coal by a mechanically operated shovel. This is shown in the cut, lifted clear of the ground into the discharging position. The coal is dumped by a chute into a railroad car, wagon or dump cart.

The truck, conveyor and shovel proper are driven by a benzine or electric motor situated at the front end of the truck. This is covered by a hood, but even that is concealed in the illustration by the side boards of the conveyor. A differential gear acts upon the rear driving axle, and the front axle of the truck as in automobiles has a knuckle joint.

Shovel Actuated as by a Man

The shovel is actuated by a crank drive which causes it to move in a manner similar to that of a hand shovel. It is first slowly crowded into the pile close to the ground, then it rises and throws the coal backward into the conveyor. The scoop is not fixed solidly in its frame but is so arranged that when it emerges from the pile it tilts back and so retains the coal which would otherwise spill at its edges.

The conveyor, with shovel and drive, is mounted on a carriage which can be moved at right angles to the path of the truck, so that as removal of the coal progresses, the shoveling outfit can be shifted to the extent of about 40 inches.



A Motor Truck with a Shoveling Attachment and a Conveyor for Loading Wagons with Coal

Where the shovel is to be moved long distances and the ground which it must traverse is irregular, the conveyor which is 17½ ft. high, may be swung around till lengthwise of the truck. The gage of the vehicle is about 5 ft. 6 in.; the wheel pressure behind is 2.2 tons and in front 2.9 tons.

The consumption of power by the motors averages from 12 to 15 hp. with a maximum of 20 hp. The shoveler costs about $5000 and will handle from 39 to 65 cu.yd. per hour.

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Why Proximate Coal Analyses Differ†

By A. C. Fieldner‡

SYNOPSIS—Proximate analyses of coal samples of identical composition may vary greatly even when made by chemists of undoubted ability and according to recognized standards. Thus the moisture content found may vary with the chemist, and the ash percentage of two determinations of one coal may vary 1 per cent. The content of fixed carbon and volatile matter found by two chemists with identical samples may differ by 4 per cent. If samples can be taken which accurately represent the coal in the bed, the sulphur percentage as determined by two chemists will usually agree within 0.05 per cent. Oxidation is the cause of errors in the moisture determination. Inequality of the heat applied, in the ascertaining of fixed carbon, volatile matter and ash, occasion the irregularities found in estimating their percentages.

In recent years, chemical and physical tests have come into use in connection with the mining and utilization of coal. Within certain limits these tests are useful, not only in establishing the fuel value, but in directing the coal into the market for which it is best adapted, and of maintaining the standard of the output to meet the requirements of this market.

Proximate Analyses of the Same Coal Vary

The growing practice of buying on specifications demands accuracy and strict uniformity in the methods of sampling and analysis. Chemists who make only occasional examinations of coal do not, as a rule, realize the empirical nature of the proximate analysis, and while they may obtain concordant results, as far as their own laboratories are concerned, their determinations may not agree with those obtained in another laboratory.

These discrepancies, which are more likely to occur in some determinations like those of volatile matter or of fixed carbon, tend to discredit the whole analysis in the eyes of those engineers who are not familiar with the difficulties peculiar to each individual determination. The object of this paper is to call attention to the fact that some constituents may be determined much more accurately than others, and to present some experimental

*Abstracted by E. P. Buffet, from the German.

†Part of paper entitled "Accuracy and Limitations of Coal Analysis," read before the Coal Mining Institute of America, at the winter meeting, Dec. 19, 1912.

‡Bureau of Mines, Pittsburgh, Penn.

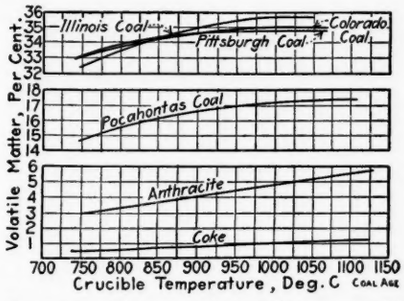
data bearing on the variations which are likely to occur in good laboratory practice.

Tests Vary with Nature of Service to Be Rendered

Coal is used principally for fuel purposes; hence its value, other things being equal, is proportional to its calorific power. The different kinds of coal, however, vary greatly in character, so much so that each has its own particular field of usefulness. For instance, a Pittsburgh steam coal cannot be burned efficiently in an anthracite furnace, nor can a coal high in sulphur or phosphorus be used for the manufacture of foundry coke.

Certain other tests, then, are also required, and for this purpose, we have the conventional proximate analysis and the sulphur or phosphorus determinations. While these tests may be sufficient for most industrial purposes, it is desirable at times to know the elementary composition of the coal as shown in an ultimate analysis, and to ascertain its clinkering properties as indicated in the relative fusibility of the ash. No doubt other tests more suitable for individual needs will come into use as the chemist learns what coal really is.

For fuel purposes the constituents of coal may be grouped into the following three classes: 1. Water or moisture. 2. The mineral impurities which remain in a somewhat altered condition, as ash on burning the coal. 3. The organic or combustible matter, which, like the original vegetable matter, is composed mainly of the elements carbon, hydrogen, oxygen and nitrogen.



Curves Showing Variation of Volatile Matter with Temperature

The Empirical Substitute for a True Moisture Determination

Moisture may be accurately determined in an inorganic substance like iron ore by drying the material at a temperature slightly above the boiling point of water and noting the loss in weight. The same method when applied to coal is complicated by the oxidizing tendencies of the organic compounds, and the possibility of loss of some water of composition at the temperature of drying.

The present methods of analytical chemistry do not distinguish with certainty between added moisture, that is water which is simply mechanically held by the coal particles, and water which may be in some unstable chemical combination in the coal substance. The usual method of drying a pulverized sample for one hour at 105° C. (221° F.) is, therefore, somewhat arbitrary, and to secure uniform results a strict adherence to a standard method of procedure is necessary.

In the Bureau of Mines method[1] the moisture is determined in two stages: (1) The coarse sample received by the laboratory is pulverized to ¼-in. size and then air-dried at 30° to 35° C. (86° to 95° F.). The loss in weight, which is called the air-drying loss, includes all the superficial and a large portion of the loosely retained moisture.

(2) The air-dried sample is then pulverized in a closed ball mill to avoid loss of moisture, mixed and sampled down to a small, powdered sample in which the residual moisture is determined, by heating 1 gram for 1 hour at 105° C. (221° F.) in an oven through which dry air is being circulated. By this method duplicate results in the same powdered sample seldom vary more than 0.15 per cent.

Intrinsic and Extraneous Ash

Ash is the incombustible residue left on burning coal. It is derived from the mineral impurities in the fuel and is largely composed of silica, alumina, lime and iron compounds, together with smaller quantities of magnesia, titanium and alkali compounds. The silica, alumina and titanium are derived from sand, clay, shale and slate; the iron oxide mainly from iron pyrite; and the lime and magnesia from their corresponding carbonates and sulphates.

The ash-forming constituents of coal may be classified in two groups:

1. Mineral matter present in an intimate mixture with the coal substance, derived either from the vegetable structure or from earthy matter intermixed as silt during the process of coal formation.
2. Mineral matter occurring in the form of thin bands and nodules of shale, bone and pyrites; in this class are also the fragments of roof and floor that become mixed with the coal in mining.

Mineral matter from the first source cannot be removed by washing; it is sometimes called the "intrinsic ash" of the coal. Mineral matter of the second class, sometimes called "extraneous ash," may be removed by washing, screening and picking. In the laboratory a similar separation can be made by the float-and-sink test.

Coal has a specific gravity somewhat less than 1.35; the impurities are heavier; hence a separation may be made by placing the coal, crushed to a suitable size, in a solution of calcium or zinc chloride of 1.35 specific gravity. The coal will float, while the shale, bone, pyrite, etc., will sink. In this way the possibility of improving the quality of coal by washing can be determined.

Presence of Carbonates and Pyrite Make Ash Determination Variable

The determination of ash, although one of the simplest operations, is also beset with certain difficulties, which lead to disagreement between different laboratories, more especially with coals containing notable quantities of calcium carbonate and iron pyrites.

On ignition the calcium carbonate is decomposed, and carbon dioxide driven off, either partially or completely, depending on the duration and temperature of ignition. The iron pyrite is changed to ferric oxide, while more or less of the sulphur combines with the lime to form $CaSO_4$.

For example, in certain experiments with Illinois coals, which contained notable quantities of calcium carbonate and sulphur, 14 per cent. ash was obtained by ignition to constant weight at a low-red, and 13 per cent. ash was obtained by ignition at a bright-red heat. To secure con-

[1] Stanton, F. M., and Fieldner, A. C., "Methods of Mining Coal and Coke." Technical paper 8, Bureau of Mines.

cordant results a standard temperature should be adopted. If this is done duplicate determinations on the same powdered sample will agree to within 0.2 per cent.

Usually More Ash in Coal Than Any Analysis Will Show

Coal ash, as determined, usually weighs less than the mineral matter from which it is produced. This is due mainly to the loss of volatile constituents during ignition; the shale and clay will lose their water of composition; the carbonates will be more or less decomposed, giving off carbon dioxide, and the iron pyrites will be changed to ferric oxide, giving off sulphur.

Several methods have been proposed to compute the weight of original mineral matter in the coal, by adding corrections to the weight of ash obtained by ignition. These methods are, however, too complicated and uncertain in their general application to all classes of coal to be used in technical work.

The Percentages Described as "Volatile Matter" and "Fixed Carbon"

The volatile matter and fixed carbon represent the relative proportions of gaseous and solid combustible matter which may be obtained from the coal by heating it in a closed vessel. This is done by heating, for exactly seven minutes, a finely powdered sample in a small, covered platinum crucible, supported in the flame of a bunsen or Meker burner. The volatile matter consists mainly of the combustible gases—hydrogen, carbon monoxide, methane and other hydrocarbons—and some noncombustible gases as carbon dioxide and water vapor. The volatile matter does not include that part of the water present in the coal which can be driven off as moisture at 105° C. (221° F.) or lower.

The residue of coke left in the crucible after deducting the ash is reported as "fixed carbon." That term does not represent the total carbon in the coal, as a portion of this element is driven out in combination with hydrogen in the volatile matter; furthermore, fixed carbon is not pure carbon, but still contains several tenths per cent. of each of the three elements, carbon, hydrogen and oxygen; from 0.4 to 1.0 per cent. of nitrogen; and about half the sulphur which was in the coal.

It should be clearly understood that the terms "volatile matter" or "volatile combustible matter" and "fixed carbon" do not represent any definite compounds which existed in the coal before heating. The method of determination is purely arbitrary, and variations in temperature and rate of heating will cause variations amounting to several per cent. Even with a strict adherence to the method recommended by the American Chemical Society, variations of 3 and 4 per cent. in both the volatile matter and fixed carbon may occur in different laboratories.

Variations of 3 per Cent. Which Are Not Errors

One of the most prominent factors in causing variations is the temperature at which the crucible is heated. This is especially pronounced in anthracite and semibituminous coal. It is not improbable that one laboratory would report 4 per cent. and another 7 per cent. volatile matter on the same sample of anthracite, or 14 per cent. and 17 per cent., respectively, on the same sample of Pocahontas coal. These different percentages of volatile matter were actually produced by different conditions of heat treatment. Caution must therefore be observed in making comparisons of the volatile matter and fixed carbon in proximate analyses made in different laboratories. Even determinations made at the same laboratory by the same analyst may vary to the extent of 0.5 per cent.

Recently a series of experiments were made at the Pittsburgh station of the Bureau of Mines to provide data on which to base a temperature specification at which the most uniform analytical results could be obtained.* A series of determinations at temperatures varying from 750° C. (1382° F.) to 1100° C. (2012° F.) were made on five different types of coal and one sample of foundry coke. These determinations were made in a 30 c.c. platinum crucible, which was heated in an electric furnace under uniform conditions. Oxidation was prevented by passing nitrogen into the crucible. The results obtained are illustrated in the accompanying figure and set forth in detail in the table.

MATTER VOLATILIZED AT DIFFERENT TEMPERATURES

Volatile matter as percentage of whole coal sample

Temperatures	Coke	Anthracite	Pocahontas	Pittsburgh	Colorado	Illinois
740-745	0.40	....	.....	32.86	32.99	.....
745-750	....	2.84 2.96	14.66	.....	.....	32.38
750-755	0.51	....	14.80	33.13	33.00	.....
755-760	0.56	.....	.....	.....	.....	32.51
765-770	....	2.93	.....	.....	.....	.....
770-775	....	....	.....	33.68	.....	.....
785-790	....	....	.....	33.69	.....	.....
790-795	....	....	.....	.....	33.70	.....
795-800	....	3.25	.....	33.89	.....	.....
805-810	0.55 0.54	....	15.85	34.05	34.07	.....
810-815	0.60	3.33	.....	34.11	.....	33.60
815-820	....	3.23	.....	.....	.....	.....
825-830	....	....	16.17	.....	.....	33.98
835-840	.63	....	.....	.....	.....	.....
840-845	....	.57	.....	.....	.....	.....
850-855	....	3.59	.....	.....	34.12	.....
855-860	0.53	....	.....	34.70	.....	34.54
860-865	0.44	....	.....	34.75	.....	34.63
865-870	....	3.70	.....	.....	.....	.....
870-875	0.53	....	.....	.....	.....	.....
885-890	....	....	16.49	.....	.....	.....
890-895	....	....	16.45	.....	.....	.....
895-900	....	....	.....	.....	.....	34.99
905-910	....	....	.....	34.57	.....	.....
910-915	0.68	3.93 4.15	.....	.....	34.62	.....
915-920	....	....	16.70 16.92	34.75	34.80	.....
920-925	....	....	.....	.....	.....	35.18
935-940	0.71	....	.....	.....	.....	.....
955-960	....	....	.....	.....	34.93	.....
960-965	....	....	17.03	35.00	34.94	35.60 35.70
965-970	0.80	....	.....	34.92	.....	.....
970-975	0.85	.....	17.13	.....	.....	.....
975-980	....	4.63 4.63	.....	.....	.....	.....
1000-1005	....	....	.....	34.87	.....	.....
1005-1010	0.95	....	17.10	34.82	34.97	.....
1010-1015	0.91	4.86	.....	.....	35.02	35.55 35.86
1015-1020	....	5.00	.....	.....	.....	.....
1025-1030	....	....	17.30	.....	.....	.....
1050-1055	1.02	....	.....	.....	.....	35.63
1055-1060	1.02	....	.....	.....	.....	35.89
1060-1065	....	....	.....	.....	34.89	.....
1065-1070	....	5.19	17.21 17.33	34.72 34.82	34.97	.....
1075-1080	....	5.36	.....	.....	.....	.....
1085-1090	....	....	17.35	.....	.....	.....
1110-1115	....	5.60	17.49	.....	.....	.....
1120-1125	1.22	....	.....	.....	.....	.....
1125-1130	....	5.71	.....	.....	.....	.....
1130-1135	1.25	....	.....	.....	.....	.....

It will be seen that more volatile matter is obtained at the higher temperature, although the ratio between temperature and volatile matter varies in the different coals tested. The curve for anthracite is remarkable in that it is practically a straight line. Those for the three bituminous coals become horizontal at about 950° C. (1742° F.). The Pocahontas curve retains a slight upward inclination even at the higher temperatures.

From the analytical standpoint, 950° to 1000° C.

*Fieldner, A. C., and Hall, A. E. Influence of temperature on the determination of volatile matter in coal. Eighth International Congress of Applied Chemistry, vol. X, p. 139 (1912).

(1742° to 1832° F.) appears to be the best temperature for the determination of volatile matter, as slight variations in temperature on the upper end of the curve produce less deviation in results.

SULPHUR DETERMINATION CORRECT TO 0.05 PER CENT.

Sulphur is usually determined in connection with the proximate analysis. It is classified with the impurities and undesirable constituents of coal, although it usually exists in a combustible form and contributes to the heating value. Commonly sulphur is present as iron pyrite, either in brassy lumps and bands or in very fine particles uniformly distributed throughout the coal. Sulphur may also occur in combination with iron and lime as sulphates and in combination with the coal substance as organic compounds.

Duplicate determinations by the "Eschka" method on the same powdered sample will usually agree to within 0.05 per cent. Where much sulphur is present in visible form, as pyrites, difficulty is experienced in obtaining a representative powdered sample from the coarse aggregate, and somewhat greater errors, due to inaccuracies in sampling, may occur.

(To be continued)

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Ventilating Mammoth and Skidmore Beds

BY H. M. CRANKSHAW*

The Mammoth bed is customarily worked from the Skidmore bed by rock chutes spaced at 120-ft. centers. Air tunnels are driven from the Skidmore bed up to the Mammoth, every 360 ft., at which point a crosscut is also made between the gangway and airway in the Skidmore.

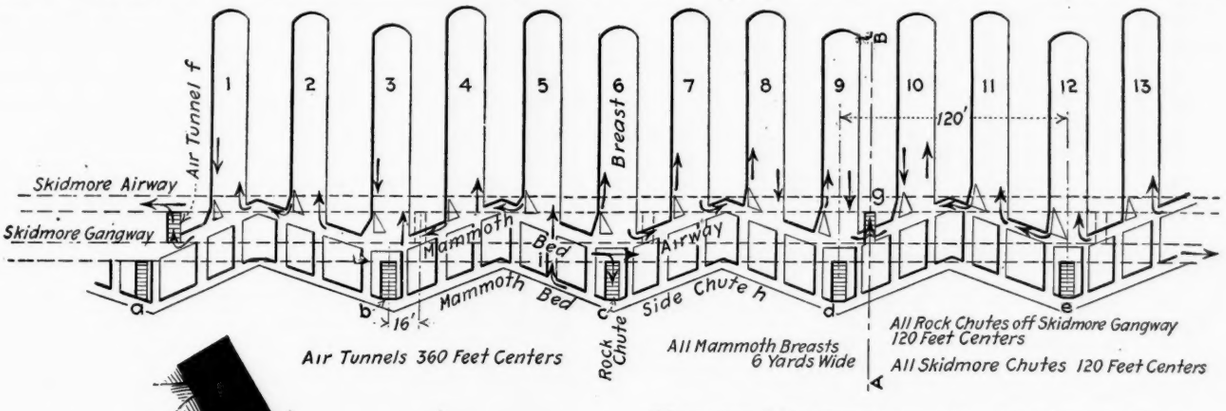
We can arrange to split the air passing through the live workings by taking it up through a rock chute and passing it up and down the chambers and through the airway connecting them till the next air tunnel is reached. At this point, the air returns to the Skidmore airway.

In the accompanying plan the rock chutes from the gangway in the Skidmore to the side chute in the Mammoth are marked *a, b, c, d* and *e*. The air tunnels from the airway in the Skidmore to the airway in the Mammoth are *f* and *g*. It is obvious that all the rock chutes from the gangway will not be needed as intakes but all the tunnels from the airway will act as returns.

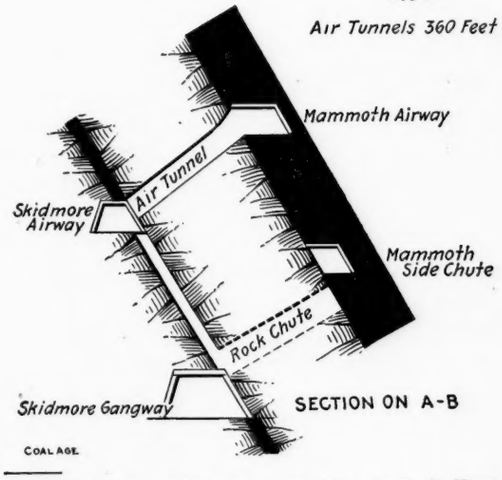
For example, consider the section between air tunnels *f* and *g*, as shown by the arrows, the air travels up the rock chute *c*, up the side chute or slant *h* and the traveling way *i*, reaching the second slant chute or airway. Here the air is split. Part goes up breast No. 5 and part to the right along the airway. That traveling up the breast returns after reaching the face and passes along the airway ventilating successively breasts Nos. 4, 3, 2 and 1. Eventually it returns to the Skidmore airway by the air tunnel *f*.

The other split passes up to the faces of breasts Nos. 6, 7, 8 and 9 respectively and descends by air tunnel *g* to the airway in the Skidmore. In this way, there are never more than five breasts on one air split, so if one breast makes gas freely, it can be isolated with the other breasts on that split without shutting down the whole gangway.

Also when breasts Nos. 1 to 5 are worked out, a cement stopping can be placed in air tunnel *f* and the whole section can be entirely abandoned, thus saving the cost of maintaining extensive airways, chutes, etc. It is also possible to work any section separately or as desired, and the same system applies equally well to any size of breasts or any system of chutes we may care to use.



HOW THE MAMMOTH BED CAN BE VENTILATED BY SPLITS FROM THE SKIDMORE HEADINGS



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The important points to be kept in mind during the manufacture of briquettes are: (1) The percentage of moisture should be kept as low as possible. (2) The binding agent should not add largely to the percentage of ash. When possible only organic substances should be used in binding materials, as the use of inorganic substances adds to the incombustible part of the briquette and correspondingly decreases the calorific power. (3) For domestic purposes the shape of the briquette should be modified to suit the demands of the consumer.

*District superintendent, Lehigh Coal & Navigation Co., Lansford, Penn.

Note—Abstract of article read at meeting of Panther Valley Mining Institute, Dec. 7, 1912.

Regulation of Boreholes through Coal

By O. P. Hood* and A. S. Heggem†

SYNOPSIS—A rough draft of a bill to cover the relations between mine owners and oil and gas operators. The objects sought in the regulations governing the wells themselves are: To supply a free vent for all gas escaping from the packers, a casing which is free to slide past the measures in case of any movement of the same, the protection of the casing by a coating of clay, impervious to corrosive waters and plastic enough to remain uncracked after deformation and capable of transmitting side pressures in such a way that the strain on the inner casing may not be local in character.

The following suggestions are an attempt to harmonize as far as possible the information and advice which has so far been available to the bureau. Suggestions have come from those interested in the safety of miners; those interested in mining operations and the boring of gas and oil wells; and those interested in geology and the conservation of the coal, gas, oil and other mineral resources of the country. There has been no attempt to put these suggestions in proper legal phrases nor to make them entirely complete, but only to frame them so as to form a basis for discussion and further suggestion at this conference. It is hoped that as a result of this consideration, suitable laws may be suggested to the various states which will make mining more safe and prevent mineral waste.

Appointment of Gas- and Oil-well Inspectors

It seemed to be the general opinion that some form of inspection is necessary in order to make operative any laws which may be enacted, and which required specific methods or results. It is, therefore, suggested that there be a chief inspector of gas and oil wells; that he have sufficient help of a permanent and temporary character to meet the exigencies of the well-drilling business and that these officers shall have certain duties prescribed.

Licenses Required before Drilling

In order that it may be possible to locate a well, with accuracy, which goes through a workable coal seam, and which may at some time be within a mine area, it seems desirable to require a license to drill, this license depending upon the filing of proper maps and records. In case a location is proposed which may be detrimental to a coal mine, from the standpoint of either safety to the miner, or economy in the working of the mine, a conference between the three parties interested in such location is provided, these parties being the mine owner, the well owner and the miner, as represented by the state mine inspector.

The gas- and oil-well inspector is given power to change the proposed location within reasonable limits in order to insure a safe and equitable condition. It is also required that the inspector shall keep records of his office, so that at any subsequent time it may be possible for a mine operator to locate abandoned wells with accuracy. He should not be obliged to proceed in ignorance of their existence.

Abandonment of Wells

In order that the wells shall be properly plugged when they are abandoned, it has been suggested that the well driller shall furnish a bond which is to be returned to him when the plugging has been properly done. The inspector is required to supervise this plugging, so that a record becomes available of the method employed and the satisfactory accomplishment of this operation.

In making a provision, that wells which have suspended operation shall be maintained in a safe condition by the well owner, it is believed that formal abandonment will naturally follow rather than neglect.

What Is a Workable Coal Seam?

These suggestions cover only those wells which are put down through workable coal seams. A definition of this term "workable coal seam" is so difficult that it has not been attempted, and the responsibility for a reasonable interpretation of this phrase is placed on the state geologist whenever the matter becomes one of dispute. It is believed that some such official would interpret this phrase in view of the intention of this act, namely, to protect the miner while working seams of coal that may be used during the reasonable life of any well. It is not the intent to require special protection for all seams of coal which are physically workable. The exploitation of some of these will probably not be attempted before the well is abandoned and plugged.

Survey Requirements

It is believed that the location of a borehole should be so accurately determined that it could at any time be relocated, even after all surface indications have disappeared; and for this purpose it seems necessary to have the survey made by competent persons and reference made to established boundaries. These must be located by reference to at least three monuments or reference points. It is also desirable that all maps should be on the same scale.

In order that gas may not be drawn into the ventilating system of any mine, a minimum distance from a mine opening has been provided, and a similar minimum distance to those buildings which are vital to safety in the operation of a mine, so that in case of fire, of either wells or mine buildings, the risk shall not be increased.

Location Relative to Haulage Ways

It seems evident that a borehole should not go through any mine haulage or airway, and in order to insure this a distance of 15 ft. from such mine haulage or airway is required. It is believed that if pillars are considered necessary about such a borehole that the supporting power of the haulage-way ribs will be sufficient, as it seems to be generally admitted that such a pillar does not serve the purpose of keeping out gas which may leak around the casing.

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†Petroleum expert, Bureau of Mines, Pittsburgh, Penn.

Note—A paper read before a conference called to determine proper legislation covering the drilling of gas and oil wells in the coal regions, held at Pittsburgh, Feb. 7 and 8. The full title is "Suggestions for Laws and Regulations in the Matter of Boreholes Passing through Workable Seams of Coal."

In requiring casing from surface water, it is believed that after the casing which goes through the coal seam is properly placed and packed as required that the one used for excluding the surface water may be withdrawn. The double casing which is required through any coal seam is deemed necessary because should a mine be opened, the operation might be fraught with much danger if the casing had been exposed to corrosion or if the pipe were injured by a movement of the measures. In order that the casing might be allowed a certain amount of play in conforming to the side strains resulting from such movements, it is required that they be extended into the floor a sufficient distance, that they be surrounded by a clay pack and that the second casing shall be brought into play through the pressure of a similar clay pack.

The Clay Filler

Clay was thought to be a more desirable material for packing than cement. It would not under strain be so likely to develop cracks through which corrosive water might enter if the outer casing was penetrated. Moreover it was felt that the use of clay would prevent the localizing of stresses on the second casing in case of a movement of the measures. A hard connection would transmit the stresses in such a manner that the casings would have to break, not being able to bend. Clay is believed to be of such a nature that it will prevent leakage of gas even if the casings are deformed by a movement of the strata.

The second casing, which is provided through any coal seam, may extend downward to any depth, but in the event that it is stopped 10 ft. below the first casing, when it is cemented in place, this cement does not extend to the first or outer casing. This facilitates the drawing of the outer casing when the well is abandoned.

Where the casings pass through a mine excavation, a further mechanical protection is provided by a suitable wall and clay pack surrounding the casing, with the intent of preserving it from mechanical injury and corrosion. Where such a casing passes through an inaccessible mine excavation a similar protection is attempted by applying a cement covering held within an outer metal tube acting as a form.

The Free Vent to the Atmosphere

In the arrangement of casings and casing head, it is proposed to require a free vent to the atmosphere from a point in the wall below any of the casing used and to demand that this vent shall be maintained by openings which cannot be readily closed by ignorant or malicious persons.

Where oil is allowed to rise within a casing above the floor of a mine, as it may during the disuse of a well, it may find its way past the several casing seats and into the mine, so that it seems necessary to keep the level of any such oil below the mine floor.

How a Well Should Be Plugged

In suggesting a plugging method, it has been attempted to keep the requirement as simple and as general as possible. The method is based on the theories that while clay alone may make a good stopping, it is also apt to flow and not be maintained where it is believed to be. Also, that cement mortar or concrete is apt to be porous, to deteriorate in oil, and to form a plug of doubtful tightness. It has, however, the quality of probably staying where it is put. To combine these two qualities, it is suggested that there be a body of cement on each plug and that a length of clay filling shall be placed above and below the cement, so that if there is any movement of fluids through the cement, the clay will be carried into small openings and eventually close them. It also seems desirable that there be a hard, solid portion through any coal seam, so that if struck by mining tools it is immediately disclosed.

We submit the following suggestions for laws and regulatons to control the drilling and abandoning of boreholes passing through workable seams of coal:

OFFICERS

Method of Appointment—A chief inspector of gas and oil wells shall be appointed by the governor from an eligible list of men who have passed a satisfactory examination showing technical fitness for the position.

Salary—The yearly salary of the chief inspector of gas and oil wells shall be —— dollars. Necessary traveling expenses to the amount of —— shall be borne by the state and an office equipped with suitable filing arrangements provided.

Assistants—Assistant inspectors of gas and oil wells, subject to the authority of the chief inspector, may be appointed by the governor.

Deputies—Competent men may in an emergency be deputized by the chief inspector to perform the duties of the position in the field, but an appeal from their decisions may be made to the chief inspector. Deputies may receive not over —— dollars per day and actual expenses not exceeding —— dollars per day.

DUTIES

Location—It shall be the duty of the inspector to receive applications for permission to drill boreholes and issue a license to drill to persons who comply with the law.

The inspector shall receive and file maps, giving the location of boreholes; shall determine the sufficiency of such maps, and shall cause a new survey of such location in case the maps shall be deemed insufficient.

It shall be the duty of the inspector or his assistant to examine the maps accompanying applications for permission to drill boreholes, and where the location is in the vicinity of a mine, he shall immediately proceed to the site and notify the district mine inspector and the coal operator to state whether the location on the map accompanying the application to drill is such as will interfere with the safe and economical operation of the mine.

The inspector shall issue a license when the proposed location of a borehole is such as not to interfere with the safe and economical operation of a mine, as determined by the mine owner, state mine inspector and himself. To this end he shall have the power to move the location of a proposed hole as hereafter specified.

After hearing and duly weighing the evidence he shall permit the borehole to be drilled at such point as will in his judgment permit the safe and economical operation of the mine.

Records—It shall be the duty of the inspector to keep a complete record and prepare for publication a yearly report of the number of wells drilled in his district together with their location; date of completion; depth; production; date of abandonment and name of owner.

Supervision—It shall be the duty of the inspector to examine each well in his district at frequent intervals, giving special attention to all wells containing gas in quantity which may be, in case of leakage, a menace to a mine, and to see that all the provisions of this act are observed and strictly carried out.

Complaints—He shall receive and investigate all complaints as to injury, present or impending, due to a lack of precaution on the part of any well owner or mine operator, and if he finds the complaints against the latter well founded he shall lay the facts before the state mine inspector.

Plugging Wells—Upon receiving notice of intention to abandon a well the inspector or his assistant shall proceed to such well and satisfy himself that the provisions of this act referring to plugging wells are complied with. He shall join the owner in making affidavit to the manner in which the well has been plugged.

Violations—If the inspector discovers any well being drilled, operated or plugged contrary to the requirements of this act, he shall order the workmen engaged upon such well to cease work at once and until the law is complied with.

Enforcement of Laws—To enable the inspector to perform the duties imposed upon him by this act, he shall have the right at all times to approach and examine any well in his district, and with the authority of the state mine inspector, enter any mine affected, and upon the discovery of any violation of this article or upon being informed of such violation, he shall institute proceedings against the person or persons at fault, under the provisions of the law provided for such cases.

In case of failure of the owner to properly plug an abandoned well, it shall be the duty of the inspector to have the work properly performed by contract and assess the cost against the well owner.

Penalties—There shall be adequate penalties provided to aid in obtaining the safer conditions here proposed.

LOCATION

Application—Any person (firm or corporation) purposing to drill a borehole through a workable seam of coal shall make application in writing to the chief inspector of gas and oil wells for permission so to do, and he shall not commence drilling until such permission, in writing, has been received by him. In case of dispute the state geologist shall determine whether a seam of coal is workable within the intent of this act.

Survey and Maps—Accompanying the application for permission to drill such borehole there shall be submitted a map showing the location of the proposed borehole with reference by course and distance to the boundaries.

Said map must be made on a scale of 200 ft. to one inch, and shall be based on surveys made by surveyors or engineers of recognized standing, and certified to by the surveyor or engineer making the same.

In case the inspector finds the map insufficient to enable him to locate the proposed well with accuracy, he shall require that another survey and map be made before permission to drill is granted.

If the original map is found to be correct the cost of the second survey and map shall be borne by the state.

Bond—Any person (firm or corporation) purposing to drill a borehole through any workable seam of coal shall be required to give bond in the amount of —— dollars to insure that the drilling and abandoning of such borehole shall be in accordance with the provisions of this act.

Distance from Buildings, etc.—No borehole penetrating a gas- or oil-bearing formation shall be located within 300 ft. of a shaft or entrance to a coal mine not definitely abandoned or sealed nor within 100 ft. of any mine shafthouse, boiler or engine house, or mine fan. No borehole shall be located to reach the coal bed within 15 ft. of any mine haulage way or airway.

License—Should the proposed borehole be so located as not to interfere with the safe and economical operation of any mine and the previous requirements of this act be complied with, a license shall be granted and said person (firm or corporation) may proceed to drill such borehole in accordance with the further provisions of this act.

PROTECTION OF COAL MEASURES

Casing from Surface Water—Any borehole penetrating any workable seam of coal shall be cased by the owner of the borehole with a suitable casing (conductor or drive pipe) so as to shut off all surface water from entering the coal seam.

Casing Through Any Coal Seam—Any borehole, drilled for gas, oil or other mineral shall be drilled to a point at least 20 ft. below any workable seam of coal which may be penetrated ,and receive a metal casing not less than ¼ in. in thickness and an outside diameter 4 in. less than the borehole. This casing shall be concentrically seated on the bottom of the hole and shall extend to the surface and shall be known as the first casing.

A second inner casing 4 in. less in diameter shall extend at least 10 ft. below the first casing and be seated in 1 to 2 cement mortar 9 ft. in depth. The inside of the second casing shall be open to the atmosphere its full length.

The intervening spaces between the second and the first casings and between the first casing and the borehole or outer wall shall be filled with puddled clay to a height 30 ft. above the coal seam.

Casing Through Accessible Mine Excavation—Casings which pass through a mine excavation shall be protected by a wall of concrete or of masonry or brick laid in cement mortar, extending from 2 ft. below the mine floor to the mine roof. Between the first casing and the wall thus constructed there shall be left an annular space of not less than 2 in., which must be filled with puddled clay. This work shall be done by the well owner.

Casings which are exposed by mining operations shall be covered as above by the mine operator.

Casing Through Inaccessible Mine Excavation—Where a borehole passes through an inaccessible mine excavation the outer casing shall be protected by cement mortar held within a metal tube 4 in. greater in diameter than the casing and extending from 4 ft. below the mine floor to 4 ft. above the mine roof or cave.

Casing to Exclude Water—Before drilling a borehole into a gas- or oil-bearing formation a string of casing shall be so set as to exclude all water from the lower borehole.

Tubing a Gas Well—To conduct gas from a gas-well tubing shall be inserted with a suitable packer located below the inner casing and in such manner as to prevent the escape of gas except through the tubing.

The inner casing shall be left open to the atmosphere throughout its full length.

Tubing an Oil Well—To conduct oil from an oil well, tubing shall be inserted and extend from the oil-bearing formation to the top of the well.

The inner casing shall be left open to the atmosphere throughout its full length.

Should gas be liberated in the well in sufficient volume to have commercial value it may be shut in by means of a packer placed below the inner casing and be conducted from the well through tubing inserted into the well parallel to the oil tubing.

Casing Heads—Casing heads must have at least one opening to the atmosphere to which a valve or plug cannot be attached, so as to insure ample vent in case of leakage into casing spaces.

Completion of Well—When a borehole has been drilled and put into operation the owner shall file with the inspector a statement of the total depth of the hole, the sizes and lengths of casing used and remaining in the hole, the depth and thickness of all coal seams penetrated and whether oil, gas or water is obtained.

Suspended Operation—When for any cause a borehole which passes through a workable seam of coal shall cease temporarily to be operated the inner string of casing shall be maintained open to the atmosphere. Should oil tend to rise in the well above the bottom of the first or outermost casing passing through the workable coal seam, such oil shall be pumped out by the owner and its level maintained below the bottom of this casing.

ABANDONMENT OF WELL

Notice of Intention—When any oil or gas well is to be abandoned the owner shall notify the chief inspector in writing of such intent to abandon and proceed with plugging methods only after complete arrangements for inspection shall have been made and permission granted.

Method of Plugging—In abandoning a well it must be entirely filled from bottom to surface. The lower hole must first be filled to a point 5 ft. above the lowest gas- or oil-bearing formation with sand, clay or rock sediment. Above each formation supplying gas, oil or water and immediately below any workable seam of coal there shall be a plug as hereafter described, and each well shall have not less than three such plugs whatever the formation.

This plug shall consist of 25 ft. of cement mortar made of 1 part portland cement and two parts of sand properly mixed and placed with a bottom dump bailer upon 5 ft. of clay resting on a seasoned wood plug 2 ft. long and of the same diameter as the hole. Five feet of clay shall also be placed on top of the cement section. The space between the plugs here called for must be filled solidly with puddled clay, sand or rock sediment, cement mortar or concrete. The filling shall be complete up to the bottom of a casing before such casing can be drawn and the filling shall continue length by length as the casing is withdrawn, using cement, mortar or concrete when passing through coal seams.

Log of Method of Plugging—When a borehole has been plugged an affidavit stating the method followed, the materials used, and the distances occupied by each material shall be certified to by the gas- and oil-well inspector and filed with the oil-well inspector and a duplicate with the county recorder.

Release of Bond—After, and not until these several requirements have been met, any bond which may have been given by the owner shall be returned.

Fees—Shall fees be charged for license and inspection?

EDITORIALS

Tax Valuations of Coal Property

At a recent meeting of the Mining and Metallurgical Society of America (New York Section), the subject for discussion was "Systems of Mine Taxation."

Interesting descriptions of methods of valuing mineral property in many different states and countries were brought out in the discussions of the principal paper of the evening, by J. R. Finlay; who, it will be remembered, was retained by the State of Michigan in 1911 to appraise the mineral properties of the state for this purpose.

This subject of taxation is being agitated in nearly all mineral-bearing states and countries, and the general public has come to believe that in the past, injustice has been done other property owners by reason of the valuation of mineral lands being too low.

There is, undoubtedly, ground for this feeling, as there are many instances known where the valuation of mineral property is relatively much below an equitable basis, as compared with other taxable real estate, and on the other hand, there are instances of excessive values when all the factors that make up the worth of mineral land are considered.

The subject of the taxable value of coal lands in Luzerne County, Penn., has recently been in the courts on an appeal by the Lehigh Valley Coal Co., from the assessment of 1907 on its Franklin colliery. Many other appeals are pending, but it was agreed by the County Commissioners and the Taxpayers Association to make a test case and apply the decision to other cases, not formally tried.

The trial of this case was long and tedious, and it is unnecessary to follow the details, but the striking feature brought out in the evidence is the wide difference between the expert mining engineers representing the two sides.

The average of the estimates of five engineers representing the company was $750 per acre, and of five engineers representing the county was about $3050 per acre. These two sets of engineers used the same maps, etc., to get at the content of the property. These figures are here quoted to bring out the fact that no logical method of determining the real value of coal-bearing lands for taxation purposes, appears to have been developed or adopted anywhere.

In most counties of Pennsylvania, and we believe in other states also, valuations are largely matters of compromise between the local assessor and the corporation representatives, subsequently revised by the county commissioners.

As a result, many instances of great inequality, entirely unjustified by the geologic or mining conditions of adjacent properties, are known.

We believe the time is ripe for the adoption of common-sense systematic methods of arriving at values for the purposes under discussion, and suggest a method not by any means new; but seldom considered by taxing authorities.

Appraisal of such property, in our opinion, should be based on the probable proportion of the original content of coal that can be *won and prepared into a marketable product.*

Under this method, the holders of the coal properties are to be considered as land owners, offering their lands for lease on a royalty basis; that is, on the basis of a fixed royalty per ton, of each size of coal, to be paid as the coal is mined. By this method, the calculated value of the lands as a present asset, is the present value of the money which, compounded at interest, will ultimately pay to the land owner or lessor the royalties (dividends or profits) receivable from the coal yet remaining to be mined therefrom.

In calculating the present worth, it is assumed that 5 per cent. is a reasonable interest for investments of this character.

We believe this is a fair method of valuation for the reason that rates of royalty for coal lying in beds of known thickness and quality are, in the older mining regions, well established; in fact, far better established than the valuation of the lands on an acreage basis, or a basis of future profits from operation. This method necessitates an approximate estimate of the date of ultimate exhaustion of the tract under consideration, which determines the annuity period.

The particular point we make is that mineral lands should be valued as a *present asset,* not speculatively, as would appear to be the case in the testimony of the engineers for the commissioners in the Luzerne County suit.

Weather Bureau Mine Service

Referring to the circular recently sent out by the U. S. Weather Bureau, from its several stations in the coal-mining districts of the country, notifying the mine operators of each district that if they so desire, information will be given them promptly, from time to time, of weather changes that are liable to affect conditions in the mines, a contemporary comments on the possible value of this service to mining.

Dr. Holmes, director of the U. S. Bureau of Mines, is quoted as expressing the fear that the warnings themselves may add to the risks and dangers in mines where gases occur in dangerous quantities. The investigations of the past two years, by the Bureau of Mines, are said not to have given conclusive results as to the influence of weather conditions, especially barometric pressure, on the condition of the mine atmosphere.

In the same connection, Dr. Holmes is quoted as using the old argument that such warnings may tend to make miners and operators less careful during the periods in which no warnings are given. He adds, however: "If they should serve to make miners and operators more careful at the time of danger, they will serve a good purpose, in gaseous mines."

COAL AGE referred to this mine service offered by the

Weather Bureau, in an editorial, Jan. 25, in which it expressed the hope that the service, being a responsible one, would be appreciated by those mine officials having no barometer at the shaft.

Mining men differ, to some extent, on the supposed influence of weather conditions on the atmosphere in the mines. It is sometimes stated that the indications of the barometer are too tardy to be of any value in giving warning of the change in conditions in the mine. For several years past, we have made a careful study of the relation existing between the indications of the barometer and the appearance of gas in mines generating gas, especially in mines having large abandoned areas.

We have barometric charts showing the changes of the barometer continuously during the past six years. During a portion of this time, we received reports from firebosses in different mines, in the same locality where the barometric readings were taken; and these showed continually that the indications of the barometer preceded the change in condition in the mine, from two to three hours.

In regard to the Weather Bureau's proffered service, we can endorse the statement of Dr. Holmes that "the value of the service will depend on the way in which it is used." We do not doubt for a moment that such warnings promptly given should prove of great value to the intelligent mine official; and if such warnings are freely offered to operators, they should be held the more responsible for not having availed themselves of the opportunity of forestalling a dangerous condition in the mine. In each case, the action to be taken after the warning is received will depend on the particular conditions existing in the mine, and this can be determined only by the officials in charge.

The Danger of the Outside Driver

The outside-wheel locomotive, either electric or gasoline, where connecting rods are not employed, is a fruitful source of minor accidents about mines. On these machines the brake mechanism between the drivers forms a possible foothold for the trip brakeman. In attempting to step aboard the moving motor, should this man's foot slip, it is almost certain to be caught and crushed by the rear wheel. Many of the crippled and one-footed men to be seen about the collieries can trace their misfortune to this cause.

It appears to be utterly useless for the management of any mine to forbid men from getting aboard the locomotives in this way. So long as the opportunity is there, and the man wishes to get upon the machine, the temptation to do so from the side is well-nigh irresistible.

So numerous have been the accidents from this cause that some companies refuse to buy any new motors of this type, while the machines which they already posssess having outside wheels have been guarded by an auxiliary plate or sheet of steel, which is hinged at the top of the motor frame and secured at the bottom by two or three bolts. This plate completely incloses both driving wheels and brake mechanism and presents no projections whatever, that can possibly serve as a foothold.

If the outside-wheel locomotive possesses sufficient advantage over those of other types to warrant its manufacture or purchase, in the interest of humanity and our brakemen's feet, let us house in its dangerous drivers, and just so far as we are able, render it impossible for anyone to get caught beneath them even though such a misfortune might be only the logical outcome of a man's own carelessness, negligence or willful disobedience.

Conditions Favorable to the Coal Industry

In many parts of the United States the chief bugaboo of the coal industry has been oil and gas. The supplies of these natural fuels have been growing less each year, and as a consequence their price in the market has advanced materially.

The benefit to the industry brought about by this change has not been confined entirely to the Western states. Plants at various Eastern points, which for many years have been burning oil as fuel—notably at such places as Worcester, Mass., and Allentown, Penn.—have been compelled to return to the use of coal, owing to the fact that the oil producer will not contract with these consumers for a further supply of fuel oil.

The rapid dwindling of the natural-gas supply in most parts of the United States has already caused many manuacturers, who have been depending on gas for fuel, to install producer-gas plants. All of these conditions are tending to the betterment of the coal industry through bringing about an increased coal consumption. Adding to this favorable situation the improvement which prevails in our export business, which latter trade amounted to $78,000,000 last year, it does appear that the owners of coal mines should view the future with optimism.

British Indian Efficiency Methods

Resting during working hours and eliminating waste of time by reducing distances traversed are two principles carried to their conclusions in British India. J. R. R. Wilson, at the recent meeting of the National Association of Colliery Managers (Yorkshire, England, branch), stated that 24-hr. shifts are quite common in the Raniganj coal field. "Of course, the men are not working all the time; they eat, sleep and work at will. The system probably arises from the fact that numbers of them live a long way off and they do not care to and could not perhaps make the journey every day. Sleeping in the mines is quite common, both on the part of the piece-worker and of the day hand."

Reduction Gears

As turbines inherently involve high rotative speeds, many of their applications necessitate some means of transmitting their power at greatly reduced velocity. For this purpose a reduction gear provided with a floating frame so supported as to equalize tooth pressures, has been devised for large capacities.

An official test of a 6000-hp. set has shown an efficiency of 98½ per cent. over a wide range in load.

The reduction gear was primarily intended for marine practice, to permit the turbine and propeller to be operated at their most efficient speeds, but has been adopted for driving large direct-current generators, and may be used to interpolate between the high and low relative speeds of any two movers.

SOCIOLOGICAL DEPARTMENT

How the H. C. Frick Co. Eliminates Accidents at Its Mines

By Thomas W. Dawson*

The company has originated a device for automatically controlling high-pressure air compressors and has applied for a patent on the mechanism. When the temperature of the discharge air in the pipe reaches a predetermined point, showing that the air is being excessively compressed, it acts on the thermometer and the recording device, thus closing an electric circuit and energizing a solenoid. This in turn moves over a tripping device, which opens the pilot valve, releasing the steam pressure on one side of the regulating piston. Thereby the valve on the steam feed pipe is automatically closed, shutting off the flow of the steam to the compressor, thus stopping it and preventing an explosion.

Protection against Shaft Accidents

At all shafts where men are hoisted, the engines are equipped with an automatic device, which acts directly on the engine, cutting off the steam and applying the brakes, making it impossible to hoist the cage beyond a safety point.

At the bottom of shafts which have sumps, it is frequently necessary to remove fine coal which falls from the dumping platform above. During this removal, the cages are hoisted to a clearance height, and iron pins are placed in holes in the guides and on these the cage rests, making it impossible for the engineer or others to lower it into the sump. These pins are always in place, being attached to the guides by chains which prevent the removal of the pins when not in use.

There is a device installed at surface landings of all shafts to prevent gates from being opened when the cage is not in position at the landing. When the cage is at the right height, it serves as a fulcrum, so that the gate latch may be opened. This device also controls a spring switch on the track leading to the cage at the surface landing, which opens when the cage is in position, and is closed at all other times.

All hoisting compartments of shafts are lined at the cage ends. This provision with that of safety gates prevents workmen from being caught during the movement of the cage.

Inspections in Triplicate

All cages and safety catches are periodically inspected, tested, and a written report made of the inspection. In no case, is a hoisting rope kept in service longer than two and one-half years, even though apparently safe and in good condition.

Frequent inspection of air shafts must be made to keep them open and free at all times from ice and other obstructions. A fireboss must make this examination, and travel either up or down such shaft once each day, the mine foreman once each two weeks, and the superintendent once a month. It has been the practice for some years to pass exhaust or live steam into the air compartments of such shafts during the winter months, to prevent ice from forming therein.

More Air Provided than Law Requires

Article No. 2 of the general rules of the company states that: "Mines generating explosive gas must have, at the intake, not less than 500 cu.ft. of air per minute, per person employed in the mine, and so distributed that there will be sufficient volume in circulation in and around the working places, to give not less than 300 cu.ft. of air per minute, per person employed in each split.

No mine shall have at the intake less than 300 cu.ft. of air per minute, per person employed, and sufficient volume shall be supplied in and around working places to give, at least 150 cu.ft. per minute, per person employed in that split. This rule provides increased air at working faces and at the intake, above that required by the state mining law.

These measurements of air supplied are carefully made and reported to the general office once each week. Local officials, at mines which generate gas, are required to keep air up to the working places, and to such other places where explosive gas might be encountered.

On all ventilating fans can be found the Bristol recording and "U" gages, and these are kept in good and operating condition. At a number of the larger and more recent plants, the ventilating fan is operated by two engines, one on each side of the same and each of them is powerful enough to operate the fan in case of failure of one or the other.

Here is installed a system of piping, with valves, by means of which either engine, or both, can, in case of accident be stopped immediately by the attendant should he be in either engine house. All ventilating systems in the mines are ascensional.

Clowes' Hydrogen Lamp

We do not rely on the ordinary safety lamp for the detection of gas. The Clowes' hydrogen-test lamp is used in all mines generating methane. This will detect a very much smaller percentage of gas than can be discovered when watching the indications of an ordinary safety lamp. Samples of air are taken in gaseous mines and sent in copper cans to the company's laboratory where they are analyzed. A detailed report is filled out by the party obtaining the sample, who is usually a mine foreman, his assistant or a fireboss.

The results of the analyses are reported to the general office and to the mine, and if there should be a percentage of explosive gas which might have been de-

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Note—Abstract from paper entitled "Welfare, H. C. Frick Coke Company," read before the winter meeting of the Coal Mining Institute of America. Continued from our issue of Feb. 8, 1913, page 230.

tected by the Clowes' lamp, the party making the test and reporting no gas is required to explain, and perhaps to hand in his resignation. In this way, all the underground officials are trained to make careful investigations.

Boreholes are frequently drilled from the surface to release any dangerous accumulations of explosive gas in the gob where these cannot be removed by the mine ventilation. Shotfirers have been employed to do all blasting and they are required to inspect all places where shots have been fired to see that there is no fire or other danger thereafter. Only the safest permissible explosives are used, and all tamping is done with clay.

All safety-lamp mines must be examined on Sundays, holidays and lay-off days, and all mines which have been idle for more than two consecutive days are examined before operations are renewed.

In the larger mines, wherever safety lamps are used, auxiliary escapeways are provided. In some instances these are stair shafts from the surface to the mine, located in the active working sections. These shafts are also arranged so that they will aid ventilation. In other instances, means of escape are provided by having connections between mines which are closed by double iron doors. Frequent examinations are made to make sure that these doors are always in condition for use in case of necessity.

Where coal dust is a menace to safety, a system of pipes and a supply of water under sufficient head and all necessary appliances are provided to dampen thoroughly the floor, sides and roof of all parts of dry mines.

Means of Avoiding Accidents from Cars

When a trip of loaded wagons has been hauled to the shaft bottom, the rope rider, at most mines, releases the rope or chain by using his foot to remove the slack so that the pin attaching the chain may be extracted. This dangerous practice has been eliminated by a simple device which disengages the chain as soon as it is given slack.

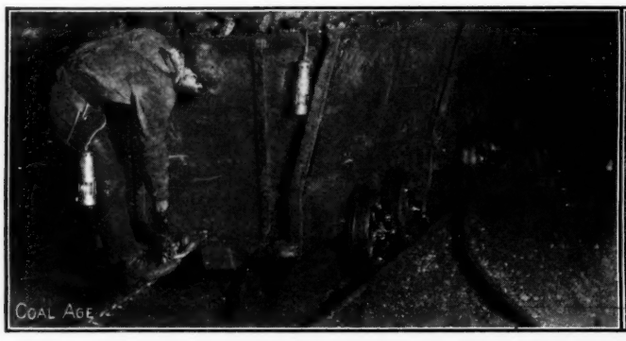
At the bottom of steep headings safety switches are provided, so that in case of a runaway, the trip is derailed before it can reach the main headings, the landing or possibly the shaft bottom, with a consequent accident and even loss of life.

Brakes are provided for mine cars, eliminating the use of sprags where braking is necessary. The wide or clearance side of all headings in the mine is indicated by a wide whitewashed strip so that the driver, brakeman or any other workman can at once note the clearance side of the heading when passing a moving trip.

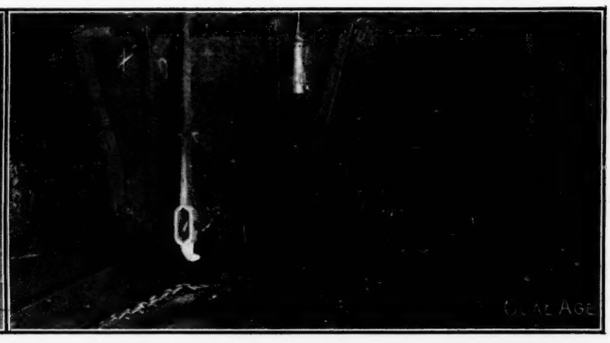
All underground trips controlled by motors, steam engines or other mechanical means must carry front and rear lights. Underground signal systems on all haulages are standardized. All apparatus in connection with these signals is kept in good working order. On electric haulage you will see the block system, similar to that used in the operation of street cars in our towns and cities.

Timbering Provisions

Systematic timbering systems are devised and strictly followed. Printed regulations cover the system of timbering in rooms, headings and rib and pillar drawing, and are worked out to suit conditions at the various mines. Timber is not set without caps or crossbars as safety depends so much on their use and only when it is so set will it bear its full share of the load which it is intended to support. A post extractor is furnished so that timber can be withdrawn in safety and a long hook is provided for the recovery of timber when making a "fall."



Ordinary Method of Releasing Chain of a Haulage Rope by Use of Foot



Frick Method of Detaching Haulage Rope without Risk to Trip Runner

Boreholes for Pipes

Another point of technical interest is that high-pressure air lines for underground haulage are placed in boreholes from the surface to the mine, thus eliminating accidents from the bursting of these high-pressure pipes. Also, in a number of cases steam lines are placed in special boreholes drilled for the purpose, and water discharged from main pumping stations to the surface by way of boreholes.

On compressed-air haulages, at the charging stations, there is protection provided to the engineman, so that he cannot be injured while attaching or detaching the supply pipe of the locomotive.

All the mines of the H. C. Frick Coke Co. have complete mine telephone systems. Phones are located at the various landings, shaft bottom, mine foreman's office, connecting with the superintendent's office on the outside, where a connection can also be made with the general office at Scottdale. Thus in case of accident, immediate attention or assistance can be obtained.

(*To be continued in an early issue*)

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In gaseous mines the coal seams should be worked out systematically and completely in order to bring about a uniform subsidence of the strata, thus preventing the accumulation of gas in reservoirs.

DISCUSSION BY READERS

Reducing Ventilation When Firing

Letter No. 12—After reading Mr. McAllister's letters, in recent numbers of COAL AGE, I was inclined to think that he was not serious, or, at least, that he had greatly exaggerated his statements or is himself mistaken as to the facts observed. Not one man in a thousand has had the opportunity of making tests such as as he has described; or would have the nerve to experiment with his employer's property in such a reckless manner.

During the 30 years I have worked in the mines I have had ample opportunities of studying the different conditions that exist. I worked as shotfirer in a very gaseous mine, in the north of England, where my instructions were that not a shot was to be fired if the lamps showed the faintest trace of gas at the working face. This often occurred, and the only remedy was to increase the circulation so that the air would dilute and sweep away the gas. Since it is well known that marsh gas (CH_4) will only explode when mixed with a certain amount of air, someone might say: "Stop the fan and let the place fill with gas, and then fire the shots." It is safe to say that such argument would not appeal to many practical mining men.

Mr. Waterman (Letter No. 6) states that the advocates of reducing the ventilation at firing time "have been, for the most part, content with recounting their personal experiences." I would like to ask, what better proof can be found than that of "personal experience." This discussion arose from the personal experience of Mr. McAllister; and if any good is to be derived from the discussion, it will be through the personal experiences of others, either confirming or disproving the theory he advances. Many practical men, myself included, have a high regard for theory where it can be applied to everyday practice.

Referring again to Mr. McAllister's experience, I call to mind an explosion that occurred in our mine, caused by a single shot; and there was not a trace of gas in the mine. The explosion killed 20 men and destroyed all the overcasts and many stoppings, besides doing other damage. Although we did not stop the fan when firing, after that occurrence; but adopted the use of permissible explosives and fired as before with the full current of air in circulation, there were no more explosions in the four years following. But, suppose, instead, we had adopted the practice of slowing down the fan and had put doors on the upcast shaft, no more explosions occurring, we would have concluded that such practice was correct and that it prevented other explosions.

The practice of slowing down the fan, or stopping it altogether when firing, may possibly work in some mines, but it can never become a general thing.

This is a subject that should receive the close attention of all our expert mining men, who should strive to prove or disprove the correctness of the theory. But until shown to be wrong, the old practice of running the fan at the normal velocity when firing, should be continued. If Mr. McAllister, however, has not converted a single man to his belief, he has still the satisfaction of knowing that he has called attention to a subject that is worthy of discussion.

THOMAS HOGARTH.

Heilwood, Penn.

Letter No. 13—We are operating a pick mine and, at times, have some very heavy shooting. It is our custom to run the fan at a speed of from 35 to 40 r.p.m., during working hours. The other evening, my duties required me to go into the mine, at shooting time. Having been much interested in this discussion, it occurred to me to speed up the fan to 50 r.p.m. before going down, which I did.

Upon going below, I met one of the shotfirers, and asked him the question : Considering your own safety and the safety of the property, do you prefer to slow down the fan, or to increase its speed when firing? Not knowing that I had speeded the fan before coming down, he replied: "When I am shooting I want the fan to run about the same as it is running now. This is a good air." I might add the speeding of the fan, in that case, gave no trouble.

I believe it is important, however, to regulate the air according to certain conditions, as they exist in the mine. For example, a new mine that is just being opened has a comparatively small air space; and the number of shots fired is correspondingly small. The volume of the workings and the number of shots fired increase with the development of the mine. At the present time, in our mine, we are firing from 250 to 300 shots, in about 95 minutes. Many mines fire a larger number of shots in less time. It seems to me that it is of the utmost importance to give more time for firing, so that the air current will be able to handle the large volume of smoke and gases produced by the firing of the shots. I believe mine accidents will be reduced by this method more than by reducing the ventilation.

AN INDIANA FIREBOSS.

Linton, Ind.

Letter No. 14—As bearing on the question of reducing the ventilation when firing in a mine, my attention has been drawn to a statement of Mr. Verner, COAL AGE, Jan. 11, p. 75. In speaking of electrical firing, in mines Mr. Verner refers to the concentration of a strong dust-laden current returning toward the face, where a single shot has been fired. He adds, that this concentration of dust-laden air, which he styles "draft concentration," is minimized or fully eliminated when a large number of shots is fired at one time.

Mr. Verner concludes his obscure reasoning with the statement that, assuming each of the 100 shots fired simultaneously produces an equal effect, the "draft concentration" affecting each shot would be less than, say 10 per cent. of the effect produced by the firing of a single shot. No attempt is made, however, to explain the reason for this "dangerous draft."

Except in steeply-pitching seams and under extreme conditions of temperature, a velocity due to an air column, in an entry, could not exceed, say 800 ft. per min., as a simple calculation would show. But, even assuming a draft of high velocity returning toward the face, following the blast, it is hard to see how the firing of a large number of shots at one time will reduce this draft, so that the heat and flame produced will be less liable to ignite a dust cloud than when a single shot is fired.

Stopping or reducing the ventilation in a mine, at the time of firing, may or may not reduce the chances of a dust explosion in a large mine generating little or no gas. However, this is not proven by the bare unsupported statement of a theory. When a man starts to propound a theory for the guidance of practical mining men, he should make clear the facts on which his theory is based, so that others than he can judge whether or not his conclusions are correct.

LEONARD L. QUISENBERRY.

Johns, Ala.

Letter No. 15—The discussion on reducing ventilation when firing has been of great interest to me and I consider it of much importance in practical mining.

I fail to see any reasonable ground for reducing the air current to a low ebb when firing shots in mines. I consider it of far more importance to adopt measures that will prevent the ignition of gas and dust, than to consider how the violence of an explosion once started, may be diminished.

Mr. McAllister certainly had a remarkable experience and is to be congratulated that he is still among the living. In my estimation, a man would be taking desperate chances to place 25 lb. of blasting powder in a pile and cover it up with fine coal dust and ignite that pile together with 27 shots, at the same time; and withal remain in the mine to await the explosion. Not only would I never attempt such an experiment, but I certainly would not remain in the mine in a safety hole, as no hole inside the mine could be considered safe under those conditions. The result, in this case, has proved the truth of the old saying: "It is always the unexpected that happens." Certainly an explosion might have been expected under the conditions Mr. McAllister has described.

Willian Scaife has estimated that a pound of powder has a potential energy of 500 ft.-tons, and that this energy expended on the air, in a 10x10-ft. airway, would produce a velocity of 346 miles an hour. This estimate, if true, easily explains how tipples have been weakened, fan houses destroyed and loaded cars of over two tons weight hurled through the air like feathers in a breeze. In my opinion a mine is never safe unless it is thoroughly ventilated by an adequate supply of pure air to dilute and render harmless the obnoxious gases generated.

In the Crows Nest Pass mines of British Columbia, at Fernie, Morrissey and Michel, should the ventilation be reduced to a low ebb, the gases generated would fill the entry a long distance back from the face, in a few minutes, and make it impossible for a shotlighter to approach the working face to fire a shot, even with a safety lamp. Again, the seams here often pitch 40 and 60 deg. and generate explosive gas to such an extent that the head of the pitch where the shot is to be fired would become dangerously charged with firedamp, immediately upon the current being reduced.

The object of reducing the current is apparently to obtain a low oxygen content in the mine air. It would seem to me, however, that the atmosphere of the mine would supply enough oxygen, for a long time after the air has ceased to flow, to defeat this plan or render it effective for the purpose in view. This would be especially true in a large mine generating little or no gas. In the samples of mine air, given as explosive by G. A. Burrell, COAL AGE, Jan. 18, p. 106, one of the samples contained only 17.49 per cent. of oxygen, which, I believe, is lower than what could be, or is commonly realized at the working face.

In closing, I wish to refer to the excellent article of R. T. Rhys, COAL AGE, May 11, 1912, p. 1004, in which he classifies all the principal explosions that occurred in Iowa, from the year 1892 to date; comparing those that occurred under reduced ventilation when the fan was slowed down, with those that occurred under the normal ventilation of the mine. From the records of these explosions, I am sure that the claim that reducing ventilation at firing time reduces the force of the explosion is not supported, but the records are decidedly against such a theory. I shall watch with interest the further discussion of this subject, which must prove of much value in mining.

J. W. POWELL, Mine Manager,
Columbia Coal & Coke Co.

Coalmont, B. C., Canada.

Seven Shifts a Week

Personally I cannot agree with the Colorado Engineer, COAL AGE, Jan. 18, p. 88, who considers seven shifts a week a "fallacy." I have had some experience as mine superintendent, mine manager, etc.; and I want to say that the man who expects to be successful, working a limited number of shifts or hours for the present-day corporations, will certainly be disappointed.

There was a time, before the large companies came into existence, that six shifts a week were sufficient; but, today, with our large plants and valuable machinery to be carefully gone over, repaired and inspected, it is necessary for the superintendent, master mechanic and mine manager, to be on the job almost day and night; and often he must live, eat and sleep with the job. When that is necessary, the job will be better off and so will the man who contentedly adapts himself to the conditions and stays with the work.

I have been on the job, at times, forty-eight and sixty hours, without seeing home or bed; and when the job was done and my tonnage thereby increased by little improvements made, here and there, which would not have been made had I been at home or enjoying a season of recreation, I always feel amply repaid for the extra hours of toil.

My opinion is that living with the job will never hurt anybody as long as they are ambitious and determined to make good. Seven or even ten shifts a week cannot hurt such men. But the man who limits his time, watches the clock, and neglects business for ease and pleasure, will soon be reduced from a monthly wage to day's pay; and placed in the class in which he rightly belongs.

MINE FOREMAN.

Collinsville, Ill.

INQUIRIES OF GENERAL INTEREST

Weir Measurements

I have built a weir 6 ft. 6 in. long, in a stream in which there is a considerable velocity of approach and in which it is impossible to secure a forebay of any size.

I would like to ask: (a) What means do you recommend for obtaining the velocity of approach? (b) What formula do you prefer for the calculation of the quantity of water passing through the weir?

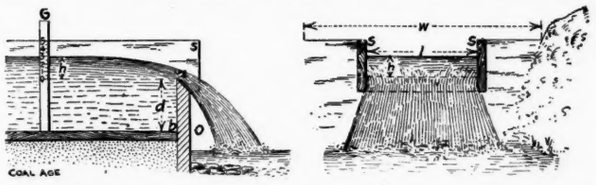
I have read the height of the water on the weir at two points, one 3 ft. and the other 8 ft. upstream. Could the difference of the readings at these two points be used to calculate the velocity of approach according to the formula $v = \sqrt{2gh}$?

W. B. T.

Canmore, Alberta, Canada.

The formula suggested by our correspondent could not be used for calculating the velocity of approach. The formula $v = \sqrt{2gh}$ gives the velocity due to any height h when a body falls from rest, or when the initial velocity is zero. But, even assuming that $h = h_1 - h_2$, which is probably the meaning of our correspondent, the formula would give only the increase in velocity between the two points at which the measurements were taken. It would not give the velocity of approach. What is required is the *average* velocity of approach, which cannot be calculated by the above formula, even if the actual head were known.

There are two or three essential points that must be observed in order to obtain accurate weir measurements.



LONGITUDINAL CROSS-SECTION AND FRONT VIEW OF WEIR, SHOWING IMPORTANT DIMENSIONS

First, it is desirable to reduce, as far as possible, the velocity of approach. In order to do this, the area of cross-section of the flow of water through the weir represented by $h \times l$ (see accompanying figure) should be small with respect to the total area of cross-section of the stream, represented by $w\ (h + d)$. To obtain good results, the depth d of the bottom of the weir below the crest a, over which the water flows, should not be less than twice the head h; and the length of the weir l, say not greater than one-third of the width of the stream w. With these limiting dimensions, the area of the cross-section of the weir will not exceed one-ninth of the cross-section of the stream; and, as a result, the velocity of approach will not exceed one-ninth of the velocity through the weir.

It is important, also, that the back of the weir, ab, shall be vertical. The cross-section of the weir must, of course, be regular throughout; the sides, also, of the weir $s\ s$ must be vertical and extended a short distance beyond the crest over which the water flows. The purpose of extending the sides is to prevent the rapid expansion of the stream of water, until it has passed beyond the point where such expansion would influence the velocity of the flow over the crest. It is always important that the weir should be so arranged that there will be no vacuum formed in the space o in front of the weir and under the waterfall. If this space is closed, the falling water has a tendency to reduce the pressure at o, which would increase the flow of water over the weir; and this increased flow would not be accounted for in the formula.

There are different methods of measuring the height h, which is assumed as approximately the velocity head of the water flowing over the crest a. A simple method is to erect a vertical gage G, in the weir, say from 6 to 8 ft. upstream from the crest a, making the zero of the gage correspond exactly with the elevation of the crest a. The reading of the gage at the surface of the water will then be the required height h, which must be measured in feet. The gage must be thin and arranged so as to prevent the formation of ripples at the surface of the water; it must present no appreciable obstruction to the flow of water through the weir.

Except in a still-water basin, the water reaches the point where its height h is measured, with a certain velocity called the "velocity of approach." It is ordinarily impracticable to measure the head to which this velocity is due, or the head to perfectly still water upstream. Moreover, as stated previously, the velocity of approach is the actual average velocity of the stream, allowing for friction and other obstructions. Experiments have shown that when the velocity of approach does not exceed 1 ft. per sec., the discharge calculated for the height h will show an error not exceeding 2 per cent. of the actual discharge.

Ignoring the velocity of approach, or taking the measured height h as the head creating the velocity of the water flowing over the weir, the flow of water may be calculated very approximately by the formula

$$q = 3\,lh\sqrt{h}$$

When it is necessary, in any given case, to consider the velocity of approach, divide the quantity of water, as calculated by this formula, by the area of cross-section of the weir, which is l times h; or this velocity may be calculated independently by the formula

$$v = 3\sqrt{h}$$

derived from the preceding formula.

The head due to this velocity of approach, or the additional head, is then calculated thus,

$$h_1 = \frac{v^2}{2g} = \frac{(3\sqrt{h})^2}{2 \times 32.16} = 0.14\,h$$

This head h_1, due to the velocity of approach, must be added to the measured head h to obtain the total head

creating the flow of water over the crest. Calling this total head H, we have

$$H = h + h_1 = h + 0.14\,h = 1.14\,h$$

The quantity of water passing over the weir is then found by substituting this total calculated head for the measured head h in the previous formula; thus,

$$Q = 3\,lH\sqrt{H} = 3.65\,lh\sqrt{h}$$

This last formula is practically correct for finding the approximate flow of water over a weir constructed according to the diagram shown in the accompanying figure, when the measured height of the surface of the water in the weir, above the crest, is h, in feet, and the length of the weir is l, in feet, assuming that the weir complies with the other conditions mentioned. The quantity of water thus found is given in cubic feet per second.

Does Carbon Monoxide Support Combustion?

In reading up on the subject of carbon monoxide, I find a conflict of opinion regarding this gas. Some books state that carbon monoxide supports combustion, while others state that it does not. Will you kindly state somewhat fully the opinion you hold in regard to this question?

M. D. COOPER.

Ellsworth, Penn.

The following quotation from "Mine Gases and Explosions," p. 62, will make our answer clearer:

> In a broad sense, combustion is any chemical reaction accompanied with the evolution of heat and often with the production of light or flame or both. Combustion always involves at least two substances, one of which is the combustible and the other the supporter of combustion, the latter being generally a gas.

Carbon monoxide is a product of the incomplete combustion of carbon in oxygen. Since the combustion of the carbon is incomplete, in this case, it is possible to carry it farther, in an atmosphere that will supply the needed oxygen; and, as a result, carbon dioxide will be produced. It is clear that the carbon monoxide is, here, the combustible, because it is susceptible of further oxidation. It is not, in this case, the supporter of combustion.

The only reason we can suggest for the statement being made that carbon monoxide is a supporter of combustion, is that the idea probably has grown out of the fact that lamps continue to burn in an atmosphere of this gas. The gas is not an extinctive gas, as is carbon dioxide, because the presence of this gas in air does not depress or extinguish the flame; but the combustion of the gas itself in contact with the flame increases the heat of the latter, causing it to burn brighter and with greater intensity. A lamp will not burn in an atmosphere of pure carbon monoxide, since there is then no available oxygen to carry on the combustion.

From this reasoning, it is clear that carbon monoxide cannot, in any sense, be considered a supporter of combustion, except a reaction takes place in which the carbon monoxide gives up its oxygen to another substance, in which case, it could be said to support the combustion of that substance. In all other cases in which this gas is concerned and combustion ensues, the gas is the combustible and not the supporter of combustion.

Relative Size of Intake and Return Airways

I would like to ask: Which should have the largest sectional area, the main-intake or the main-return airway of a mine, and why? The textbooks all say the return airway should have the greater sectional area, owing to the expansion of the air and gases in the mine.

In my opinion, the relative size of the intake and return airways should be determined by considering which of these airways is the haulage road. I believe it is of greater importance that the haulage road should be the larger of the two. There is scarcely an hour of the day when the haulway is not more or less blocked by trips of loaded cars, which greatly obstruct the flow of air along the road.

Besides, when the haulage road is used as a travelingway, extra width should be provided, so that men or animals can safely pass the loaded cars. For this reason, it seems to me, that considering both the ventilation of the mine and the safety of the men, the haulage road should always be the larger of these two airways.

J. BENNETT.

Lock No. 3. Penn.

The question presented by our correspondent is one that is frequently asked in mining examinations, and the answer generally given is: The return airway is the larger of the two, for the reason first stated. There is no doubt, however, but that there is much truth in the remarks offered by our correspondent in reference to the need of a large haulage road.

This is a case, as frequently happens, where the answers given to examination questions are too theoretical and ignore the practical requirements in the mine. We might add, however, that while it is well to refer to the necessity of a large sectional area for haulage purposes, it is also important and absolutely necessary that the sectional area of the return airways shall be amply sufficient to allow the increased volume of the return air and gases to travel out of the mine at a moderate velocity. This is very essential, particularly in a gaseous mine. We are glad attention has been drawn to this point, as the answers to all examination questions should cover both theory and practice.

Height of Flame Cap and Percentage of Gas

The following formulas are given, COAL AGE, Vol. 1, p. 1020, for calculating the percentage of gas from the height of flame cap:

Unbonneted Davy, $Percentage = \sqrt[3]{36\,h}$

Bonneted Davy, $Percentage = \sqrt[3]{70\,h}$

Please give a formula for calculating the height of a flame cap when using a Wolf lamp.

FIREBOSS.

Bruceton, Penn.

There is no formula for calculating the percentages of gas from the height of the flame cap, in the use of the Wolf lamp. The volatile nature of the oil burned in the Wolf lamp makes the height of the flame cap vary according to the length of time the lamp has been exposed to the gas.

EXAMINATION QUESTIONS

Air and Mine Gases

(Answered by Request and Suggested)

Ques.—Find the weight of 1 cu.ft. of dry air, at a temperature of 70 deg. F. when the barometer is 29.5 inches.

Ans.—The weight of 1 cu.ft. of dry air is calculated thus:

$$w = \frac{1.3273 \times 29.5}{460 + 70} = 0.0738 \text{ lb.}$$

Ques.—Find the weight of 1 cu.ft. of air fully saturated at a temperature of 65 deg. F. and a barometric pressure of 29 in. The tension of the water vapor, at this temperature (65 deg. F.) is 0.6176 in. of mercury.

Ans.—The weight of 1 cu.ft. of saturated air at the given temperature and pressure is calculated thus:

$$w = \frac{1.3273\ (29.0 - 0.3765 \times 0.6176)}{460 + 65} = 0.0727 \text{ lb.}$$

Ques.—How many gallons of water are carried out of the mine per minute by an air current of 100,000 cu.ft. per min., assuming the temperature of the return air is 70 deg. F., at which temperature the tension of the water vapor is 0.36 lb. per square inch?

Ans.—The weight of water vapor in this return air is

$$w = \frac{0.6235 \times 0.36}{0.37\ (460 + 70)} \times 100{,}000 = 114.46 \text{ lb.}$$

Taking the weight of water as $8\frac{1}{3}$ lb. per gal., the number of gallons of water carried in the return current, in this case, is $114.46 \div 8\frac{1}{3} = 13.735$ gal. per min., or nearly half a barrel of water each minute.

Ques.—Find the weight of 1 cu.ft. of marsh gas, at a temperature of 60 deg. F. and a barometric pressure of 28.6 in.; taking the specific gravity of the gas as 0.559.

Ans.—The weight of 1 cu.ft. of gas is found by multiplying the weight of 1 cu.ft. of dry air, at the same temperature and pressure, by the specific gravity of the gas. It is calculated thus:

$$w = \frac{1.3273 \times 28.6}{460 + 60} \times 0.559 = 0.0408 \text{ lb.}$$

Ques.—Write the chemical equation expressing the complete combustion of marsh gas in oxygen, and state what volume of carbon dioxide is produced in the explosion of 100 cu.ft. of marsh gas.

Ans.—The chemical equation expressing the reaction is

$$CH_4 + 2\,O_2 = CO_2 + 2\,H_2O$$

The coefficient of each term, in this equation, represents the relative volume of the gas concerned in the combustion. Thus, one volume of marsh gas (CH_4) consumes two volumes of oxygen ($2\,O_2$) and produces one volume of carbon dioxide (CO_2) and two volumes of water vapor ($2\,H_2O$). Therefore, 100 cu.ft. of marsh gas will produce 100 cu.ft. of carbon dioxide and 200 cu.ft. of water vapor.

Ques.—How would you proceed to remove firedamp from a section of a mine after an explosion; what dangers would you expect, and how would you overcome them?

Ans.—Before attempting to remove any considerable accumulation of firedamp, the men on the return of the air must be notified and withdrawn from that section of the mine. Under certain conditions where roof falls are imminent, all of the men in that section of the mine should be promptly withdrawn. Guard all approaches to the district by stationing reliable men to prevent anyone from entering that portion of the mine. Select only experienced men, and provide each man with a good safety lamp that has been previously examined. Arrange to increase the circulation in the affected district, as the conditions may require. Approach the trouble from the intake side, and avoid as far as possible being trapped in the gas. Erect the necessary brattices so as to deflect the current of air upon the gas. Allow sufficient time for the air current to sweep away the gas, making occasional tests to ascertain the progress of the work.

The dangers are: The possible ignition of the gas by a defective lamp or otherwise. A possible fall of roof may drive the gas back upon the men, and envelop them in an explosive atmosphere. If poisonous gases are present the men may be overcome by the gas. To avoid these dangers the work must be conducted, as explained, from the intake side, with safety lamps, by experienced men; and ample time must be given for the removal of the gas. The best type of safety lamp must be used.

Ques.—While examining for gas near the roof, if the safety lamp is extinguished without giving any of the characteristic indications of firedamp; what inference would you draw and what would be an approximate composition of the gas?

Ans.—It is possible for the lamp to be extinguished by a body of pure marsh gas (CH_4) given off at the roof; but in that case, the lamp flame, if carefully observed, should give some indication of the gas before being extinguished. Again, it is possible for the lamp to be extinguished by blackdamp, issuing freely from the roof strata and coming probably from an overlying seam that has been previously worked out and abandoned.

It is very probable, however, that the gas in question is a mixture of carbon dioxide (CO_2) and marsh gas (CH_4). Under certain conditions where these gases mix in the strata without being diluted with air, there is produced a firedamp mixture lighter than air but containing sufficient carbon dioxide to make the mixture extinctive. This mixture of carbon dioxide and marsh gas has been termed "flashdamp," for the reason that when a lamp is first elevated into the gas the pure air contained in the combustion chamber of the lamp dilutes the gas, which gives a distinct cap to the flame. But this cap appears for a moment only and is gone, owing to the lamp filling with the undiluted gas, which dims and may extinguish the flame if the lamp is not promptly withdrawn. It is this brief appearance of the cap that has given the mixture the name "flashdamp." By the addition of air the mixture becomes highly explosive, as the proportion of carbon dioxide is insufficient to prevent explosion.

COAL AND COKE NEWS

Washington, D. C.

Orders issued by the Interstate Commerce Commission on Saturday, Feb. 8, have canceled the advanced coal rates which it had been intended by the Atchison, Topeka & Santa Fé R.R. to put into effect from Colorado coal-producing regions to points in Kansas, Oklahoma & Texas. Under the new orders, however, coal rates are allowed to be established from the Walsenburg fields at a figure 10c. higher than the rates from the Cañon City field to the same points in the three states named. This new adjustment will go into effect on Mar. 12.

The commission is following the general policy of keeping coal rates down so far as possible practically everywhere. While it probably has not been more extreme in this matter than it has in regard to other advances on commodities of miscellaneous character, it is a fact that the general policy planned by the commission contemplates the keeping down of rates on staple products which are presumed to have a direct relationship to the cost of living.

In the case of coal it has been strongly desired by the administration that so far as possible everything should be done to keep the product moving steadily to market. That there has been success in this regard is claimed by some to be shown in the fact that the coal-car shortage up to Feb. 1 is reported to the commission to have increased by 1211, notwithstanding that there was an idle-car surplus of 37,260 on the same date, which was an increase of very nearly 9000 cars, as compared with the middle of January.

An advance in coal rates, it is supposed by some members of the commission, would prevent coal from moving to market quite as actively as would otherwise be the case. It is probable that the question of the attitude of the new administration on the freight-rate question generally and particularly with regard to rates on coal and other staples will be one of the first business problems that has to be met after Mr. Wilson is inaugurated.

A New Record of Output

According to information received here by Government authorities, a new record has been set for anthracite shipments in the first month of the year. The shipments in January amounted to 6,336,419 tons, an increase of 572,723 tons over January, 1912. The former record, made in January, 1903, was 5,964,950 tons, or 371,469 tons less than were shipped last month.

The immediate effect of this is shown by an increase of nearly 35,000 tons in the amount of coal on hand at tidewater shipping ports in the last month. On Dec. 31, 1912, there were 340,637 tons on hand. On Jan. 31, 1913, this amount had increased to 375,566 tons.

The Threatened Strike

The threatening developments in the controversy between the railroads and the firemen are causing considerable anxiety in administrative circles because of their dangerous charter and particularly on account of the possibility of their intensifying the coal shortage should matters come to an actual breach.

The fact that Commissioner of Labor Neill, although reappointed by President Taft, has not been confirmed by the Senate is an additional aggravation. If arbitration should be attempted under the Erdman act, the only man available for the service in the Bureau of Labor would be the present chief clerk, G. W. Hanger, who is not considered sufficiently familiar with the task to handle it successfully.

The criticism to which the Erdman act is now being subjected in the present controversy has greatly weakened the demand that that act be so extended as to permit Federal arbitration in cases involving coal-mine controversies.

PENNSYLVANIA

Anthracite

Scranton—Although the colliery engineers employed by the D. L. & W. Coal Co., in the Scranton district, have joined the miners' union, after a one day's strike at eight collieries of the company, it is said that in many instances the engineers will not have to take the oath of allegiance which would call upon them to quit work in case of mine strikes. The engineers have long hesitated about joining the miners' union because of their eligibility under the company's pension rule, which would be canceled if they went on strike or left the employ of the company.

Archbald—Employees at the White Oak Colliery of the D. & H. Co., in Archbald, have gone on strike, alleging that the company is unfair in the distribution of cars, and that certain men are being discriminated against. It is claimed by the miners that contractors in headings and gangways are working six or more men, and that these contractors are being openly favored in the number of cars furnished them.

Ashland—Following a conference of officers of the union and officials of the Reading Coal & Iron Co., 75 miners on strike for over a week because of a checking out system recenly inaugurated, agreed to return to work at Bast Colliery. Instead of the check system obliging all men to report at the colliery office nightly, forcing many of them to walk a long distance out of their way, the company has agreed to place peg-boards at all openings to the mine.

Williamstown—The Williamstown colliery resumed work Jan. 30, after an idleness of one week. The one miner who refused to join the union has quit and the men have returned to work.

Shamokin—Enterprise colliery employees have resolved that they will not work with men who refuse to pay dues to the United Mine Workers' organization. It is feared that a strike may result.

Coal stripping operations are to be started soon at the Alaska Colliery of the Reading Coal & Iron Co., at Shamokin. Two 18-ton locomotives and a 70-ton steam shovel are on the ground ready to begin work.

Hazleton—The boys at the White Ash breaker of the Lehigh Coal & Navigation Co., at Hazleton, have been given a 15 per cent. increase, putting them on equal terms with the No. 6 breaker boys.

Nanticoke—In order to do away with any inconvenience and delay in sending its officers and engineers to the different collieries, the D. L. & W. Coal Co. has installed a new auto bus which will run between Nanticoke and Kingston.

Wilkes-Barre—In addition to the elaborate provisions for rescue and first-aid work now in force in the anthracite mines, the Lehigh Valley Coal Co. is preparing for service a mine-rescue car, which can be rushed at a moment's notice to any colliery in case of accident. This car consists of a remodeled passenger car equipped with oxygen breathing apparatus and every kind of first-aid equipment. It has six Draeger helmet outfits, with the necessary auxiliary equipment, pulmotors, stretchers, blankets, splints, bandages, etc. It will be used as a hospital and ambulance combined, and rushed on call to any colliery where an accident has occurred, by special train service, and manned by a crew of trained helmet men.

Pottsville—To stop annoyance resulting from the numerous petty strikes, the Reading Co. has adopted a new policy. Where such strikes are called the operations shall remain idle until the operators get ready to resume. This rule has gone into effect in several parts of the anthracite region.

Bituminous

Punxsutawney—The Lindsey Coal Mining Co. has bought 250 acres of coal land of the Berwind-White Co., near Punxsutawney, and will make a new opening at once on the Bellwood-Punxsutawney branch of the Pennsylvania R.R. It is expected that this opening will tap nearly 1000 acres and will lead to the mining of nearly a million tons of coal.

WEST VIRGINIA

Bluefield—Twenty-one miners of the Houston Coal & Coke Co. have been arrested by Mine Inspector Nicholson on the charge that they have been shooting off the solid. Twenty of the men were fined $10 each and one was fined $30. It is learned that if this practice is not stopped Mr. Nicholson intends to have the mine foremen prosecuted for allowing the men to make use of this dangerous method.

Charleston—Much interest has been attracted by the introduction of a bill in the House of Delegates, which will

make the mine owners responsible for deeds of violence committed by guards employed by them.

Reports are current that the town of Acme has been shot up by the striking Eskdale miners. Some rumors say that 500 shots were fired. It is claimed that conditions on Cabin Creek are as bad as they ever were. The mine-guard system is inflaming the miners to a pitch where a serious outbreak may come at any time.

KENTUCKY

Basketts—The breaking of the hoisting cable in the mine of the Pittsburgh Coal Co., at Basketts, Ky., recently imprisoned the entire working force in the mine for four hours. The cage started to fall when the cable broke, but it was stopped by the safety catches, and no one was injured. The accident occurred at 2 o'clock in the afternoon, and it was 6 before the cage was put in working condition.

Whitesburg—It is announced by the Consolidation Coal Co. that coal shipments from its plant at McRoberts will soon be doubled, reaching something like sixty cars a day, most of which goes to Northwestern points. The company's mines at Jenkins, in the same field, are also making large increases in their capacity, and will cut a large figure in swelling the company's output.

OHIO

Columbus—The Colonial Coal & Supply Co. has asked the Ohio Public Utilities Commission to collect $15.70 from the Hocking Valley and the Chicago and Erie Ry. companies. The coal company claims that there was a shortage in weight on a car of coal shipped from Pomeroy to a customer in Lima. The railroad companies are charged with being negligent in the transportation of the coal resulting in the loss.

A hearing was held recently before the Ohio senate committe on mining, on the anti-screen bill pending in the Ohio legislature. Operators who spoke were C. L. Cassingham, president of the Coshon Coal Co., of Cleveland; E. M. Poston, of the New York Coal Co., Columbus; Edward Johnson, president of the Lorain, Coal & Dock Co., Columbus. All of the operators were opposed to the bill as unjust in every respect. A number of representatives from the miners' union appeared in favor of the bill.

INDIANA

Indianapolis—The supreme court of Indianapolis has reversed the decision of the appellate court and the Greene County circuit court and holds that coal in the ground and sold is taxable although it is not connected with an open coal mine This decision was handed down in the case of the Greene County officials against the Lattas Creek Coal Co.

The court thinks that after a farmer has sold the coal under his property he should no longer be compelled to pay taxes on it. These taxes should be paid by the persons who bought and own it.

Fort Branch—Two shotfirers were recently killed in an explosion in the mine of the Fort Branch Coal Mining Co., by a "windy shot" caused from the clay placed around the charge not being packed tightly enough. Horace Dewees and William Bush were the names of the men, who went into the mine after the other men had left, in order to shoot down coal for the next day's work. The first shot caused their death. The mine-rescue car from Evansville, Ind., was sent for, but no great damage was done to the mine, and the bodies were removed by volunteers from among the miners employed by the company.

ILLINOIS

Lincoln—A pocket of gas was set off, Feb. 1, by the lamp of an electrician in the Latham coal mine. Two miners were killed and thirty were imprisoned. Three hundred were in the mine.

MISSOURI

Rolla—The State Bureau of Geology and Mines has just issued a report showing that the annual coal production for the state of Missouri reaches 4,000,000 tons. The productive seams vary from 18 in. to 5 ft. in thickness.

NORTH DAKOTA

Grand Forks—Thousands of tons of coal are being consumed in North Dakota by fires which are burning in undeveloped mines. It is expected that action will be taken by the state legislature to halt this destruction of the nation's resources.

FOREIGN NEWS

Nagasaki, Japan—One hundred and fifty coal miners were entombed, Feb. 6, by an explosion in a colliery near Fukooka. Little hope is entertained for their rescue.

PERSONALS

General Superintendent Thomas R. Evans, of the Parrish Coal Co., has tendered his resignation.

D. A. Thomas, who has been visiting various coal properties in this country, and whose home address is Cambrian Building, Cardiff, Wales, sailed for home Feb. 11.

Chas. Dorrance, hitherto fuel engineer of the Lehigh Coal & Navigation Co., has been made chief mining engineer for the same company, having superintendence of the mining and mechanical departments.

Judge George Gray has appointed Charles P. Neill, United States Commissioner of Labor, as referee in three cases which the Board of Conciliation was unable to settle.

Clinton Neyhart, weighmaster at No. 3 D. & H. Colliery, has been appointed outside foreman at the Boston Colliery of the same company, to succeed William Steevers, who was transferred to No. 2 Colliery.

It has been announced that T. K. Jenkins, formerly purchasing agent of the Durham Coal & Iron Co., at Chattanooga, Tenn., has been appointed chief clerk to the assistant to the president of the Davis Coal & Coke Co.

Robert W. Johnson, for 10 years sales manager of the Ottumwa Box Car Loader Co., has accepted the general managership of the United States Coal Co., at Kemmerer, Wyo. This company has a plant with a daily output of 2500 tons.

E. T. James, superintendent of shops of the Lehigh Coal & Navigation Co., has resigned to become an assistant of Charles A. Straw, his former chief. His place is to be filled by Joseph Williams, hitherto general foreman of shops. Albert Leonarz is made assistant master mechanic in charge of the electrical department.

At the annual meeting of the stockholders of the Red Ash Coal Co., Woodward Leavenworth, John N. Conyngham, William H. Conyngham, G. Frederick Parrish and Edgar R. Reets were elected directors. The officers elected are: Woodward Leavenworth, president; G. Frederick Parrish, vice-president and treasurer; Walter Roberts, secretary.

OBITUARY

John Fritz, mechanical and mining engineer, born in Londonderry Township, Chester County, Penn., Aug. 21, 1822, died at his home in Bethlehem, Penn., Feb. 13, 1913.

His early boyhood was spent upon his father's farm, where he received what education the local school afforded. At the age of 16, Mr. Fritz became an apprentice in a machine shop; later on entering the employ of the Moore & Hoover Iron Works. It was here that he perceived the immense possibilities in the iron industry.

From the Moore & Hoover Iron Works he went with the Morristown Iron Works and later the Cambria Iron Works, at Johnstwn, Penn. While here he revolutionized the iron-rail industry, securing a better product with four-fold greater capacity of the mill, thus enabling American manufacturers to compete with those of foreign countries.

About this time he perfected blast-furnace practice. In July, 1860, he began service with the Bethlehem Iron Co. as general superintendent and chief engineer. While here he greatly assisted in perfecting the bessemer process of steel manufacture, and also in remodeling and improving the Siemen-Martin openhearth process.

Turning his attention to the production of steel plates and structural shapes, he designed mills and rolls superior to any then on the market. When the problem of making armor plate arose, he originated the solid steel plate, the superiority of which still remains unquestioned.

He took a great interest in Lehigh University and recently presented that institution with a laboratory.

The engineering profession has lost one of its great members—one who was associated with all of the principal enginering societies both in this country and abroad, which vied with each other in doing him honor. Engineers and scientific men throughout the entire world will mourn the loss of "Uncle" John Fritz, as he was familiarly called, whose name will be forever associated with the growth and development of the American steel industry.

BOOK REVIEW

BOOK OF STANDARDS. National Tube Co., Pittsburgh, Penn. 559 pp.; 4x6½ in.; leather bound, about ⅝ in. thick. Price, $2.

This is strictly a handbook devoted to pipe and allied products. Much valuable information bearing on subjects which may appear to be but remotely connected with the main theme of the work are concisely treated. Among these might be mentioned the Pitot tube, the Venturi meter, the mechanical properties of solid and tubular beams, boiler incrustation and corrosion, the properties of saturated steam, etc., etc.

Not the least valuable part of the contents is a glossary of terms used in the pipe and fitting trade. To the man unfamiliar with these and particularly to the technical student or recent graduate, this glossary alone is worth the price of the volume.

The compilers of this work express themselves as being of the opinion that it contains a greater amount of information in regard to tubular products than any other similar work of this character. We think that we can honestly concur with them in this belief.

ANNUAL REPORT, DEPARTMENT OF PUBLIC WORKS OF THE PROVINCE OF ALBERTA. 1911. 242 pp., 6½x10. Paper.

This pamphlet, as its title suggests, contains more than mining reports. It covers bridges, ferries, roads, architecture, building, steam boilers and telephones. The mining section is spread over 95 pages. It states that whereas in 1910 there was one life lost for 49,783 tons of coal mined; in 1911, 242,080 tons were extracted for each fatality.

It seems to be easier in Alberta to secure conviction of violators of the mining code than in the United States. Seven persons were fined an aggregate of $110, and paid costs amounting to $31.25. One case was dismissed. Two managers, three firebosses and two miners were convicted. All prosecutions were instituted by the mining department.

The Bellevue explosion is detailed at some length in this report. The inspector states that telephones are being installed in nearly all the mines in accordance with the suggestion of the coroner's jury, impaneled after that disaster. An arrangement is being made to ventilate the completed sections of the Bellevue mines by frequent openings to the surface, and instructions have been given the West Canadian Collieries Co., Ltd., that no further pillars may be drawn until a sufficient number of crop holes have been made where these pillars are to be extracted.

The examination questions for mine managers, "pit" bosses and firebosses are given in full, as are also the wages for all employees. Outside workers labor 10 to 12 hours, and those underground for 8 hours only.

CONSTRUCTION NEWS

Fall River, Mass.—The Fall River Gas Works Co. is making plans for a $500,000 coal gas works at Birch and Bay Sts.

Earlington, Ky.—The St. Bernard Mining Co. has installed at its coke ovens a 20-in. rubber belt conveyor for carrying coal to the washer.

Rankin, Ill.—The new $12,000 coal dock of the L. E. & W. has been completed. It is built entirely of steel and is run by a 12-hp. gasoline engine.

Centralia, Ill.—Chicago capitalists have secured a large acreage of coal land in the Zeigler district and will put up a modern colliery during the summer.

Albion, Mich.—Albion's coal mine will soon be in operation, provided high water does not interfere with the work. The shaft has been sunk 66 ft. and is now within 6 ft. of the coal.

Honesdale, Penn.—The D. & H. Co. are soon to build a washery between Honesdale and Waymart for the purpose of cleaning up the coal and culm dumps along the line of the old gravity road.

Holt, Ala.—The Central Iron Co. has broken ground for 20 more ovens, thereby increasing its byproduct plant capacity 50 per cent. The company recently completed a blast furnace at a cost of $325,000.

Schafer, N. D.—Beds of lignite will form the foundation for the new line of the Great Northern Ry. through this section. In some places the track will be built on a continuous seam of lignite. Most of this fuel which has been blasted out will be wasted.

Monongahela, Penn.—A corps of engineers under the direction of George B. Eaton is making surveys of the Charleroi coal properties sold recently to the Carnegie Coal Co. As soon as the surveys have been completed work of improvement will begin.

Uniontown, Penn.—Engineers for the W. A. Stone Coal & Coke Co. have been making surveys on the company's property near Maidsville Landing, on the west side of the river. It is stated that the surveys are preliminary to the opening of mines. The company owns 350 acres at that point.

Whitesburg, Ky.—It is announced that an eastern syndicate has bought the Sam J. Wright and John Osborne tracts of coal and mineral land, consisting of about 1200 acres. Early development is planned. A 4-mile branch railroad from the main line of the Lexington & Eastern will be constructed at once.

Battle Creek, Mich.—The big 10,000-ton coal pocket at the Commonwealth Power Co.'s plant has been completed. The coal stored in this pocket will be kept under water in order to avoid fire and explosion hazards. The sidetrack, which is being constructed to the plant by the Michigan Central, has not yet been completed.

Altoona, Penn.—Actual work has been started to transform the old Wopsy road into the Altoona-Northern line. The new road will extend from Altoona to Patton, a distance of 20 miles. The line will be designed for both steam and electric power and will carry passengers by day and coal by night. At Patton connections will be made with the Northern Cambria Ry. The company is capitalized at $750,000.

Mobile, Ala.—Information has been received that the first barge of the New Orleans & Mobile Transportation Co. will be launched about Mar. 15. The announcement is received with great satisfaction by those who are interested in the Warrior coal fields. Boats of the company will make points between Mobile and New Orleans wherever tonnage is offered in sufficient quantity to warrant. The company was organized for the purpose of developing the Warrior coal field.

NEW INCORPORATIONS

Toronto, Can.—The North Alberta Coal Co.; capital stock, $2,000,000.

Louisville, Ky.—The Purity Coal Co.; capital stock, $8000. Incorporators: A. H. Gardener, R. H. Tydings and J. T. Gardener.

Little Rock, Ark.—The Arkansas Anthracite Coal Co.; capital stock, $100,000. Incorporators: W. H. Barrett, T. M. Barrett and W. H. Barrett, Jr.

Greensburg, Penn.—The Greensburg Coal & Coke Co.; capital stock, $200,000. Incorporators: Alexander Coulter, H. W. Coulter, W. A. Coulter and Margaret Coulter.

Danville, Ill.—The Two Rivers Coal Co.; capital stock, $100,000; general coal and lumber business. Incorporators: R. H. Sherwood, W. C. Hartshorn and J. W. Hegler.

Chattanooga, Tenn.—The Paint Rock Consolidated Coal Co.; capital stock, $50,000. Incorporators: J. R. Barnes, H. B. Bonney, W. B. Garvin, J. E. Patton and G. M. Price.

Mann, W. Va.—The Kistler-Schuler Coal Co.; capital stock, $50,000; to develop coal properties. Incorporators: J. F. Kistler, Grace Kistler, E. J. Schuler, J. F. Schuler and S. A. Schuler.

Cambridge, Ohio—The Economic Coal Co.; capital stock, $10,000; to mine and deal in coal. Incorporators: C. B. McCoy, J. L. Secrest, J. A. Thrasher, Homer Whitten and F. W. Tobin.

Charleston, W. Va.—The California & West Virginia Lumber & Mining Co.; capital stock, $3,000,000; to produce lumber, mine and market coal, iron and other minerals and ores, together with oil.

New York, N. Y.—Plans have been completed for the consolidation of the Burns Brothers and the Curtis-Blaisdell Co. The new firm will be known as the Burns Brothers and will be capitalized at $2,000,000.

Fairmont, W. Va.—The Ross Coal Co. capital stock, $75,000; to carry on a coal mining and real estate business. Incorporators: C. E. Hutchinson, C. H. Jenkins, E. C. Curry, R. A. Johnson, and H. M. Pierpont.

Charleston, W. Va.—The Argyle Coal Co.; capital stock, $50,000; to do a general coal and mining business and deal in

real estate. Incorporators: W. H. Thurmond, T. H. Hooper, E. J. Payne, G. M. Jones, and A. W. McDonald.

Ashland, Ky.—The Elk Horn Fuel Co.; capital stock, $150,000; to do a general mining business and acquire real estate and mineral lands. Incorporators: R. D. Davis, Jr., J. S. Hager, K. M. Fitzgerald, Thomas Boggess, Jr., and W. P. Wheeler.

Canal Fulton, Ohio—The Fulton Pit Car Co., of Canal Fulton, Ohio, has been incorporated with a capital stock of $100,000 to manufacture mine cars and deal in iron and steel products. The incorporators are E. J. Nichler, E. E. Shilling, C. A. Vanderhoof, A. H. McCadden and George Fellmeth.

INDUSTRIAL NEWS

Elys, Ky.—The Camp Coal Co. has increased its output to 200 tons per day. H. N. Camp is general manager.

Pueblo, Colo.—The Royal George coal mine is now working on a larger scale than ever and is employing several hundred people.

Clinton, Ind.—Now that the waters of the Wabash are receding it is the hope of the management of the Lyford mines that work can soon be resumed.

Waynesburg, Penn.—Dr. J. C. McClenathan has purchased the West Aberdeen Coal Co.'s property and is now repairing mines with a view to putting them in operation.

Connellsville, Penn.—The Mahoning plant of the Cambria Steel Co. has been sold to J. M. Gray and K. K. Kramer, of Connellsville. The 82 ovens will be fired within two weeks.

Pekin, Ill.—Coal has been found on the farm owned by George W. Cunningham, 4 miles north of here. The quantity of the find is not known, but men are at work to determine it.

Providence, R. I.—At the annual meeting of the Portsmouth Coal Co., which was formerly the Rhode Island Coal Co., the stockholders voted to continue the development of the property.

Pittsburgh, Kan.—The Missouri, Kansas & Texas R.R. Co. has just completed taking options on coal leases on 20,000 acres of land in Grant Township, on the west border of Crawford County.

Jasper, Ala.—The gas development in Walker County is assuming greater proportions. The Pennsylvania Gas & Oil Co. has enlarged its working capacity and is beginning to bore for gas and oil in additional fields.

Kansas City, Mo.—The possibilities of large coal deposits as yet untouched in the Ozark regions will be investigated by a party of Eastern capitalists. Recent small finds have been made in the country near Gretna, Branson and Hollister.

Saline, Ia.—Drilling operations have been resumed after a suspension of about 8 months. In case anything valuable is found a company will furnish funds for further testing. In case a general field is indicated by the test drilling a shaft will be sunk.

Bartlesville, Okla.—A coal company, recently formed in Wann by B. W. Mizer and D. W. Bunnell, has leased a tract of land 2 miles south of town and has begun operating their mine. The seam crops out at a creek, is of good quality and is 15 in. thick.

Connellsville, Penn.—J. E. Barnes, of Pittsburgh, has secured options on 2500 acres of coal land in Whitely Township at $400 an acre. It has been reported that he secured the options for the Pittsburgh Coke & Coal Co. The options extend for 90 days.

Chicago, Ill.—The strength of the Colorado Fuel & Iron preferred stock, which has advanced to 155, is taken in some quarters to foreshadow a substantial payment on accumulated back dividends. This year's earnings are at about the same rate as last year's.

Moline, Ill.—The old Sackville coal mine which was abandoned some years ago is to be reopened. There is plenty of coal, left in the field and good management is all that is needed to make it a paying project. It has been secured by Sievers & Sommerson.

Petersburg, Ind.—The miners at the Hammond coal mine have found a vein of lead or bismuth embedded in the center of a 6-ft. seam of coal. The vein is about 3 in. thick, but no estimate can be made as to how far it runs. Samples have been sent to the assay office.

Cañon City, Colo.—The coal mines of Fremont County are in a prosperous condition and are working better than they have for months. One mine official states that there are sufficient orders now booked by the Victor American Fuel Co. to the mines and putting them in operation.

Lewis, W. Va.—Owing to the abandonment of the Lynch mine the Consolidation Coal Co. has removed its store to the Two Lick mine. The Lynch mine was opened in 1878. It was first made a modern mine by the Hutchinson Coal Co. and was then sold to the Consolidation company.

McRoberts, Ky.—The Consolidation Coal Co. announces that this plant will double its capacity. They expect to ship from 20 to 25 cars a day. The plant at Jenkins is also expected to make an increase. Thousands of men are now employed at the mines at McRoberts and Jenkins.

Tuscaloosa, Ala.—Certain Florida men have purchased 320 acres of coal land at Shira's Station. This land contains two fine seams of coal which is considered to be the best in the country. The purchasers expect to ship much of the coal which they mine. The property is situated near the Warrior River.

Steamboat Springs, Colo.—Graders on the Moffat Road extension have struck sufficient coal to last the road for years, 12 miles below here. The seam is 4 ft. in thickness and the coal is being thrown over the dump by the graders. M. A. Wogan, the Denver contractor, has charge of the construction work.

Cheyenne, Wyo.—John Skinner and son have been working all winter opening a seam of coal which they discovered on Badwater. They expect to get into the best coal within a few days and are contemplating putting it on the market as soon as they have the mine sufficiently developed to warrant hauling the coal to town.

Waynesboro, Penn.—Dr. J. C. McClenathan has purchased from W. F. Patterson 1500 acres of coal land located in Monroe County, Ohio. The amount involved in the transaction was $100,000. The new owner has not given out any plans he may have in regard to the property but it is understood that he bought it as a speculation.

Howe, Okla.—It is stated on good authority that the Southwestern Tennessee Iron & Coal Co. has purchased all the mines of the Rock Island R.R. from Hartford to McAlester. This means the opening of new mines and the working of the old ones, together with a demand for men. The properties or leases are valued at $3,000,000.

Connellsville, Penn.—A company of eastern capitalists who own about 7000 acres of mineral land in the vicinity of Kingwood have been drilling test holes on their property. Results show that the land is underlaid with a seam of excellent steaming coal varying in thickness from 54 to 62 inches. Analysis shows this coal to be of superior quality to that of the Humbert field.

Cincinnati, Ohio—Arrangements are being completed for the issuance of $10,000,000 convertible 6 per cent. notes by the Consolidation Coal Co. This new financing has become necessary owing to the great growth of the company. Of this issue $6,000,000 is to be sold at once and the proceeds used to continue the development of the company's coal lands in Kentucky, and otherwise enlarging facilities.

Racine, Wis.—The Racine Gas & Electric Co. of Racine, Wisconsin, have placed an order with the Roberts and Schaefer Co. for a large coal-dock bridge for the storing of coal at Racine and the handling of same mechanically. Contract price approximately $75,000.

This company has also secured a contract this week from the Alpine Coal Co., Ottumwa, Iowa, for a complete coal mining plant at the point.

Colorado Springs, Colo.—Alex. Patterson has opened up what is said to be the finest bed of lignite ever discovered in this state. This strike confirms the belief of the experts that the land immediately north of here is underlaid by coal deposits.

Patterson has opened up a seam 11 ft. thick, which apparently extends over several hundred acres, at a depth of 371 ft. The value of the find is estimated at $1,000,000.

Columbus, Ohio—The Kilbourne & Jacobs Mfg. Co., of Columbus, Ohio, in the annual report recently issued shows a fine year in every respect. The company is preparing to put on the market a new kind of mine car which is intended for slope mining. At the annual meeting, James Kilbourne was elected president. Felix A. Jacobs, first vice-president, James R. Kilbourne, 2d vice-president and general manager, F. W. Hubbar, secretary; Frank C. Eaton, treasurer and Joseph B. Potter auditor. Lincoln Kilbourne was elected assistant general manager.

COAL TRADE REVIEWS

GENERAL REVIEW

The continual rather cold or stormy weather over the last two weeks has had a mildly stimulating affect on the demand for hard coal. This has not materially aided the situation, however, as this demand has been concentrated entirely on one or two sizes already in short supply; these are pea and stove, the only two grades for which there is any sustained demand, and the former is the only one which now brings a ready premium. Substantial concessions on the regular circular are easily obtainable, and the individuals are creating a market by their usual methods of price cutting. All sales departments are actively seeking orders. The current month will no doubt see the smallest production in the anthracite field since May of last year, at which time the suspension in mining was brought to a close.

Contracting is the only feature of interest in bituminous circles at the present time. It is rumored that a considerable volume of the Eastern contracts are being closed at a small advance over last year's figures, and with the usual protection being guaranteed against a declining market. This applies more particularly to the Coastwise situation, few all-rail contracts having been placed so far, most operators apparently waiting action by the larger producers. In spite of the abrupt change in weather conditions, there is little demand except on contract. The movement is rather light, and prices low, with buyers showing no interest whatever in the market; there are, however, fair tonnages moving on contract.

The market in the Pittsburg district is now feeling the effect of the long period of mild weather, which greatly increased the production at the mines, and at the same time curtailed consumption; there is little active negotiating on season contracts, buyers evidently doubtful if the new prices will be maintained. At Buffalo the abrupt drop in temperature occurred at the crucial stage, and turned what might otherwise have been a disastrous slump into a fairly active market.

The change in weather conditions also brought an immediate increase in the orders for domestic coal in Ohio. This, together with the heavy steam consumption, has materially stimulated the market, although not sufficient to affect prices. The indications are for a thoroughly good business the balance of the season, and the operators are optimistic. The feature of the Southern market is a rumor to the effect that there will be a general advance on the Cahaba domestic grades, to take effect March 1. There is a tendency in this district to shade prices on the steam sizes in order to secure good business, but otherwise quotations will remain unchanged.

Colder weather has caused an increased consumption, and a rather unsettled feeling in the Middlewestern trade; however, the heavy overproduction is still tending to keep prices down. In the Northwest cold weather has made a decided change for the better, although the domestic grades continue weak. The dealer's stocks are still quite heavy, and some cancelations of orders are coming in, while others are being held up.

BOSTON, MASS.

A week of continuous cold has served to steady the market, but neither bituminous nor anthracite can be said to be at all active. Sales are few and prices are no higher than a week ago; it is simply that the downward tendency has been checked for the time being. There is ample coal at the Hampton Roads piers and what transportation reports is loaded promptly; a liberal share is going off-shore.

Contract business has already been closed in considerable volume, but only by two or three of the Southern shippers. The prices are understood to be slightly in advance of the figures for 1912 but as usual protection is guaranteed against a declining market. It is the usual straining to get business covered. Meanwhile, spot coal, Pocahontas and New River, is being sold down to $2.70 f.o.b. and even less.

All-rail there is nothing new. Buyers generally have lost interest in the current market, if indeed there can be said to be any, and prices are on last summer's level. There are the usual signs of campaigning for contracts but little is heard of actual sales being made. Most of the operators are marking time to see what position is to be taken by the larger producing companies. Cars are in much better supply and the movement is so good that cancelations, rather than orders, are the rule just now.

Individual hard-coal operators had a taste of lucrative business for a few months but now they are offering coal broadcast at prices well under the company circular. Not much of it is likely to reach New England, however, for the rates on company transportation are likely to exclude outside shipments at market freights. On Long Island Sound the margin between the company rate of 40@45c. and the market rate of 45@50c. is so small that some individual coal is still being received, but mostly on old purchases. All-rail anthracite is almost certain to be stirred up more or less by offerings of independent coal right through the season. The sales departments of all the companies are actively out for orders now and February is sure to be the lightest month for tonnage since May. Egg is still the long size, and stove and pea are again coming into supply so that free shipments of those sizes are beginning to be made.

Current wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.20@$1.35
Clearfields, f.o.b. Philadelphia	2.45@ 2.60
Clearfields, f.o.b. New York	2.75@ 2.90
Cambrias, Somersets, f.o.b. mines	1.30@ 1.45
Cambrias, Somersets, f.o.b. Philadelphia	2.55@ 2.70
Cambrias, Somersets, f.o.b. New York	2.85@ 3.00
Pocahontas, New River, f.o.b. Hampton Roads	2.70 and less
Pocahontas, New River, on cars Providence	3.85@ 4.00
Pocahontas, New River, on cars Boston	3.90@ 4.10

NEW YORK

Bituminous—In spite of a week of severe winter weather the soft-coal market has fallen off still further. Prices on all grades have receded sharply, the off qualities suffering particularly. Conditions now, however, are only about what was ultimately to have been expected in view of the abnormally open winter up to the first of the current month. As a result of this, production in the mining regions was greatly facilitated, while on the other hand consumption was correspondingly curtailed. Consumers have naturally accumulated substantial surpluses, and in the face of these conditions a reversal of form was inevitable. The abrupt change in weather conditions had a steadying influence on the trade, and while essentially weak it cannot by any means be considered down to a low level.

There is little or no activity in contracting for the new year. Because of the unsettled conditions in the spot market, consumers are holding off in the hope that the present slump will see prices forced to a low level; such a condition would, of course, have a detrimental effect on contract figures. Prices on both the hard and soft coal have suffered a more or less general reduction on all grades, and the market is now quotable on the following basis:

	Anthracite		Bituminous	
	Circular	Individual		
Broken*	$4.50	5.00	West Virginia, steam	$2.65@2.75
Egg	5.25	4.75	Fair grades, Penna.	2.75@2.85
Chestnut†	5.25	5.25	Good grade, Penna.	2.90@3.00
Pea*	3.50	3.75	Best miller, Penna.	3.05@3.15
Buckwheat**	2.75	3.70	Georges Creek	3.25@3.30
Buckwheat†	2.45	2.55		
Rice**	2.25	2.25		
Rice†	1.95	1.80		
Barley†	1.75	1.10		

* Scranton and Lehigh. ** Scranton. † Lehigh and Schuykill.

Anthracite—The advent of more seasonable weather conditions failed to have any very stimulating affects on the hard-coal market. All sizes are in free supply and can be obtained in any required tonnages, promptly. Egg is quite long, and concessions under the circular are being freely offered; nut is in fairly good demand, while stove and pea are the two short grades in the market, the latter being the only one to command a ready premium. Buckwheat is plentiful, while the same applies to barley, but there is a fairly persistent demand for rice.

There is but little doubt that substantial surpluses have been accumulated, and many dealers will not require any additional shipments until after the summer reduction in the circular goes into effect Apr. 1. The week of cold weather the first of the month helped the speculative coal to a cer-

tain extent, but it was not of sufficient duration to do more than check the slump, temporarily. Operators agree that nothing less than two or three weeks of continuous severe weather will save the situation for them.

PHILADELPHIA, PENN.

There has been a continuous run of cold weather for the last week or ten days, but while it has stimulated trade to a certain extent, the demand has been concentrated on sizes which were already short. The demand for egg coal seems to have fallen off altogether, and some dealers report that chestnut is rapidly going the way of egg. Stove and pea coal seem to be the only sizes for which there is any sustained demand, and for these the dealers are having to depend on current receipts. From now on until the spring or opening prices are announced, there is hardly likely to be any great movement of the egg and chestnut sizes, and it is understood that some of the large companies are putting some of the former size into stock.

The individuals are creating a market by their usual methods—quoting prices which dealers cannot very well overlook. This has been continuing for several weeks now, and it is only by working the lever of stove and pea that the large companies are able to work off any of the egg size at all. Of course, the production of the stove and pea sizes is limited, and with the demand as it is, there is some little premium pea coming to the market that is disposed of without trouble, but stove is at circular, and likely to remain there. The steam market is not particularly good, although it is understood that there is a fairly good movement of buckwheat. This grade is gradually falling into the domestic class, large quantities being used for both ranges and furnaces in the smaller residences.

The bituminous market is anything but favorable at the present time. Prices as well as the demand are off, although the figures secured now compare more than favorably with those being received late in the fall of 1912, but the operators do not seem at all pleased with the situation. Complaints are general that this branch of the trade has been infected with the apathetic condition of the anthracite trade, and a cure for one will bring the other back to normal.

PITTSBURGH, PENN.

Bituminous—The market has continued rather dull, and is feeling the effects of the open weather so long prevalent, encouraging production and curtailing consumption below expectations. The prompt market is dull, except that there is slightly improved demand from retail dealers. While there are inquiries against contracts to begin Apr. 1, there is little active negotiating, and buyers are evidently in doubt whether the advanced prices for the season will be maintained. The prompt market in the past few weeks has been on the contract basis, except for slack, which commanded premiums, although for prompt shipment it has now dropped to the contract level. We continue to quote: Slack, 90c.; nut and slack, $1.05; nut, $1.25; mine-run, $1.30; ¾-in., $1.40; 1¼-in., $1.55, per ton at mine, Pittsburgh district.

Connellsville Coke—The prompt coke market continues to slump, and contract coke, while not definitely quotable in the absence of sales or active negotiations, may be considered as having declined equally. In the past few days standard grades of furnace coke for prompt shipment have sold at $2.50, and it is doubtful if above that figure has been obtained within a week, while it is possible the price has been shaded. The total turnover has been very light. This makes a total decline in prompt furnace coke of fully $1.50, all occurring in less than 30 days. Contract coke, while not closely quotable, can hardly be considered as above prompt, which would make a decline in contract of $1, since $3.50 was the minimum quotation on first-half, and was actually obtained in two or three instances. We quote: Prompt furnace, $2.50; contract furnace (nominal), $2.50; prompt foundry, $3; contract foundry, $3@3.25, per ton at ovens. The slump in prices has now reached such proportions that curtailment in production will undoubtedly occur. This will be particularly with respect to off grades, which found a market during the scarcity, but can hardly be sold now at any figure.

BALTIMORE, MD.

In spite of a decided change in weather conditions during the week, there was but little demand for fuel, except on contracts. Prices were weak, steam coal being quoted around $1@1.10, while run-of-mine sold at 90c., with but few consumers interested. The movement from the mines to tidewater was light due to a lack of cars. A number of additional contracts were renewed during the week, at an advance from 8 to 10 per cent. in the price as compared with last year.

B. Nicoll & Co., selling agents for the Pittsburgh Terminal R.R. & C. Co., recently forwarded their first shipment of Pittsburgh gas coal to Spain. Early in the week, 6700 tons were loaded on the "Volnay," destined for Valencia, Spain, and about 6000 tons will be shipped this month. The coal is from the new mines opened by the Pittsburgh Terminal R.R. & C. Co., located on the West Side Belt R.R., in the Pittsburgh district.

BUFFALO, N. Y.

The sudden cold turn on the opening of February saved the local bituminous market from a bad slump. Prices had become weak and there was report, as usual at such times, of considerable coal offering at sacrifice prices, but the temperature dropped 40 deg. at the crucial point and the market began to right itself. The railroads, which had been delivering coal at a rapid rate also fell down at this time, which further strengthened the market. In a short time coal began to pile up at terminal points, especially if destined for Canada; embargoes were issued against several trunk roads and the Grand Trunk embargoed itself by refusing coal. The last active Lake Erie ferry began to freeze up with 600 cars of coal waiting for it, and Canadian coal consumers became anxious, especially after it began to snow.

It would be hard for bituminous prices to go down after such conditions had set in and it is quite possible that the market may stiffen up soon. This uncertain condition of the market creates some uneasiness as to the prices likely to be obtained for spring contracts; predictions differ 15c. to 20c., and it is quite possible that as much variation as that may be the case. It is known that contracts already let have varied more as a rule than usual. Pittsburgh lump is quotable at $2.75, three-quarter at $2.65, mine-run at $2.50 and slack at $2.40, with best Connellsville foundry coke down to $5.50. There is no change in cannel or the smithing coals, as they are not commonly affected by the fluctuations of ordinary bituminous.

The demand for anthracite has been easy of late, on account of the mild weather and the return of snow has not firmed it up much. Retailers say that a great part of the supply bought early is still unused and there is now talk of a short winter, even though February is severe, so that buying is not likely to be heavy, unless the cold weather runs quite late, as it did last year.

COLUMBUS, OHIO

Lower temperatures which prevailed during the past week were almost immediately reflected upon the coal trade in Ohio by a large run of orders for domestic grades. This, coupled with the larger steam tonnage required, stiffened the market perceptibly, but not sufficiently to advance the price list. Coal men are content that prices did not go lower and believe that there are indications of a better trade from this time on.

Dealers who had rather large stocks during the winter months and were unable to dispose of them are now placing orders with the operators and jobbers and are asking for immediate delivery Factories are also taking more fuel and the large apartment houses and office buildings are buying better. Operators believe that prices will remain at the present level until late in the summer as it is too late for rush of orders to have any great effect upon quotations.

Operations in the various mining districts of the state have been more active during the week. The Hocking Valley probably received the greatest benefit although an increase is reported from eastern Ohio and the Pomeroy Bend. The indications are very bright for an active lake season during the present year and the larger shippers are making preparations accordingly.

Operators are preparing for a good Lake trade, despite the soft winter weather which has prevailed so far in the Northwest. The supply on the docks is not large, and as a result shipments via the Lakes will probably be heavy. Arrangements are already being made for chartering vessels, and it looks like there will be a scarcity of bottoms.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawah
Domestic lump	$1.50	.....	$1.65	$1.50
4-inch	1.30	$1.20	1.35	1.30
Nut	1.45	.....	1.35	....
Mine-run	1.20	1.05	1.20	1.15
Nut, pea and slack	1.10	.....	1.10	1.05
Coarse slack	1.00	0.95	1.00	0.90

CLEVELAND, OHIO

The sudden change to winter weather put new life in the coal trade here, and prices on slack advanced 5 to 10c. a ton. The final arrival of real winter caused a feeling of comfort to shippers, and they look for a strong market during the balance of February. While reports indicate that all

manufacturing plants are operating full capacity, line trade and the spot demand have slightly diminished and shipments are largely made on contract business.

The transportation of coal has been remarkably good since the first of the year and consumers report deliveries arriving with a good degree of promptness.

Coal men are in the market for all available vessel-tonnage for the coming season of navigation on the Great Lakes; 1,000,000 tons is already under contract for delivery to principal Lake Michigan Ports at 35c. per ton, which is an advance of 5c. over last season's rate. Contracts are made subject to price adjustment, but with the demand for ore and grain tonnage, vesselmen believe that 35c. will be the established price this year. Vessel men are satisfied with the 30c. rate to Lake Superior and have placed approximately 5,000,000 tons under contract for shipment to the head of the Lakes.

Quotations per short ton f.o.b. mines are as follows:

District.	Freight rate	1-in. lump	Mine-run	Slack
Youghiogheny	$1.00	$1.40	$1.30	$1.00
Pittsburgh No. 8	0.90	1.20	1.10	1.05
Goshen No. 6	0.70	1.35	1.25	1.15
Coshocton	0.70	1.75	1.50	1.15

BIRMINGHAM, ALA.

The most interesting feature of the current week is the rumor that several of the mines producing Cahaba domestic coal will increase their prices beginning with the month of March. Some of the leading companies are now quoting $2.50 f.o.b. mines, for March and April shipment as against $2.25 for the same months in 1912. This is an increase of 25c. per ton and if adhered to during the remainder of the year, it will place the maximum price for the winter months at $3.25.

Some winter has appeared, but it has not stimulated the market except in retail trade. A slight weakness is apparent in the steam market, there being a tendency to shade prices in order to book desirable business. The coke market is unchanged.

LOUISVILLE, KY.

There is ample production of coal at the mines, plenty of cars available, and there are no impediments to traffic, but the temperature is such that the average citizen does not find it necessary to heat his residence and the wheels of industry are threatened with paralysis by reason of a lack of demand.

As a consequence of this condition, summer prices are prevailing, insofar as any quotations at all are to be had. However, many operators have practically withdrawn from the market, believing it to be useless to attempt to sell coal by cutting the prices, especially in view of the possibility of more severe weather later on. Some Indiana coal is coming into this market for steam consumption, because of the vastly reduced output of these grades in all sections of Kentucky.

The Monongahela River Consolidated Coal & Coke Co. reports that business has been fairly active on domestic grades, although this demand is merely the accumulation of an abnormally light run of orders during the high-water period. This company has recently put into effect a price of 8½c. a bushel on Pittsburgh, a substantial reduction from the price of 10c., which has prevailed through the winter.

DETROIT, MICH.

Bituminous—The unexpected cold weather has made a decided change in the local coal situation. Domestic trade still seems to be the weakest factor. Retailers' stocks are heavy and they are not inclined to place new orders while those for delivery the early part of January are being canceled or held up. However there does not seem to be the amount of domestic on track that there was a week ago which has a tendency to strengthen the market. The demand from many factories is holding up well and railroads are also taking large tonnage.

Prices for mine-run and slack are probably the strongest points in the market. Most of the West Virginia districts report less than 50 per cent. of normal capacity while in strictly domestic fields the production was even lower.

The prevailing market prices for today are as follows:

	W.Va. Splint	Gas	Hocking	Cambridge	Ohio No. 8	Pocahontas	Jackson Hil
Domestic lump.	$1.65	....	$1.80	....	....	$2.00	$2.25
Egg	1.65	....	1.80	....	....	2.00	2.25
Nut	1.35	....	1.50	....	....	....	....
¾ lump	1.10	$1.15	1.15	$1.15	$1.15	....	....
Mine-run	1.00	1.00	1.00	1.05	1.05	1.35	....
Slack	Open	Open	1.05	1.05	1.05	Open	....

Anthracite—The demand for hard coal has been unusually heavy. The cold weather has drained the supplies of all the large wholesalers, so that the consumers are again demanding great quantities. The premium is now about 25c. above circular, but should these conditions continue for some time dealers will be paying more than a dollar above circular again.

MINNEAPOLIS—ST. PAUL

A careful estimate of stocks of anthracite at the head of the lakes up to and including Dec. 13, after the last boat was in, shows the following figures: Egg, 88,000 tons; stove 67,500 tons; nut 85,000 tons; pea 8000 tons. The stove and nut is practically all gone and the pea is reduced to about 400 tons. About 50,000 tons of egg are on the docks and some companies are thinking of getting a stone crusher and reducing the egg to smaller sizes as this grade can only be used in furnaces. Some Twin-City shippers are receiving some nut and stove direct from the mines all-rail, but it comes slow owing to shortage of cars in the east.

Arrangements for making Minneapolis the head of navigation on the Mississippi River are working into a reality. With the completion of river improvements and the establishment of adequate steamboat facilities, followed by the operation of a line of freight-carrying barges, there will be a reduction in cost of transportation of fully one-third. It now costs $2 to bring hard coal from the mines to Eastern loading ports. There it is loaded and carried to the head of the Lakes for 35c., and the railroads charge a $1.25 rate to the twin cities. With steamboats coming here, the coal could be loaded on boats at Pittsburgh and brought here via the Ohio and Mississippi River route for $2, if the charge for conveying the coal from the mines to Pittsburgh by rail does not exceed 50c. per ton. A company incorporated in South Dakota has been formed by Minneapolis capitalists under the name of the Star & Crescent Navigation Co.; it is capitalized for $2,500,000.

ST. LOUIS, MO.

With some slightly colder weather, causing an increase in the consumption of coal, the market still remains in an unsettled state. Under ordinary conditions, the local trade should be in fine shape, but the overproduction in the Illinois field keeps the price below cost. The only sizes that are standing up are the small steam grades. The ice in the river has put the ferries out of commission and everything is moving via the bridges; traffic is consequently much congested. Standard mine-run has sold as low as 80c. and lump 87½c., while Carterville lump and egg have sold at $1.10, with nut at $1.

The prevailing prices, however, are:

	Carterville and Franklin Co.	Trenton and Big Muddy	Mt. Olive	Standard
2-in. lump	.....	.....	.....	$0.95
3-in. lump	.....	.....	$1.25	.....
6-in. lump	$1.25	.....	1.40	1.15
Lump and egg	$1.45 @ 1.60	$2.00	.....	.....
No. 1 nut	1.25	.....	.....	.....
Screenings	0.90	.....	.....	0.60
Mine-run	1.20	.....	.....	0.85
No. 1 washed nut	1.50	.....	.....	.....
No. 2 washed nut	1.40	.....	.....	.....
No. 3 washed nut	1.35	.....	.....	.....
No. 4 washed nut	1.35	.....	.....	.....
No. 5 washed nut	1.00	.....	.....	.....

OGDEN, UTAH

Shipments continued good from both the Wyoming and Utah mines during January, except for the shortage of equipment on the Rio Grande railroad which to date has not been entirely relieved. This condition has continued for practically two months and has greatly diminished the shipments from the Utah mines. Idaho, Washington and Oregon are short on Utah coals and the operators anticipate good business during February and March on account of this shortage.

The Nebraska and Kansas market has not recovered from the extensive shipment in the later part of December and January and at present consignments into this territory are at a minimum. The railroad could not be persuaded to remove the east routing placed on the cars until the mines had accumulated a great number of loaded cars drawing demurrage at Rock Springs. Then, after the Eastern market had been flooded, they removed the embargo and allowed the cars to be billed west. However, the damage was done and there is nothing for the mines to do but wait until this over supply has been partially consumed.

There has been an over-production of slack and some of the larger operators have reduced the price to several large consumers which if continued will place the slack market in bad shape. Both Utah and Wyoming prices continue as follows: Lump, $2.75; nut, $2.25; mine-run, $1.85. Wyoming slack brings $1, with Utah 25c. higher.

The box-car situation on the Union Pacific Railroad has been somewhat relieved, and a good portion of the equip-

ment sent to the mines for loading is closed. The mines in Utah are still bothered with a car shortage, although the situation is slightly relieved, and no doubt in a short time there will be sufficient equipment available. The officials of the Denver & Rio Grande Railroad have succeeded in overcoming the congestion along the line, and coal is now moving in reasonable time.

SPOKANE, WASH.

Fear of a coal famine in Spokane and the Inland Empire has been alarming the citizens here for the past two weeks, on account of the conditions of the railroads in the mountains, but the local coal dealers state that although they have been running close for the past month, conditions are now improved to such an extent that there is no further cause for alarm. There is no advance in the price of coal, quotations continuing as follows:

	Crows Nest	Wyoming Northern	Wyoming Southern	Utah	Montana	Roslyn
Lump	....	$6.45	$7.20	$7.20	....	....
Lump and egg	....	....	....	....	$6.35	....
Furnace	$6.00	....	....	....	....	....
Egg	....	5.95	6.85	6.85	....	....
Mine-run	5.00	....	....	....	....	$5.00
Slack	4.50	....	....	....	....	....
Screened domestic	....	....	....	....	....	6.25

PRODUCTION AND TRANSPORTATION STATISTICS

SAN FRANCISCO, CALIF.

The total deliveries of coal by sea into this port for year 1912 aggregated 374,556 tons, of which quantity 135,438 tons was the domestic product, consisting of 110,299 tons of Pocohontas for the U. S. Navy, and 25,139 of steam coal from the State of Washington, for use on the Pacific Coast Co.'s steamers. Imports from British Columbia were 149,830 tons, and from Australia, 89,288 tons.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Feb. 1 as follows:

	Surplus	Shortage	Surplus or Shortage
New England Lines	49	233	184
N. Y.; N. J.; Del.; Maryland; Eastern Penn.	1,676	1406	**270**
Ohio; Indiana; Mich.; Western Pennsylvania	6,049	211	**5,838**
W. Va.; Virginia; N. & S. Carolina	1,103	2380	1,277
Kentucky; Tenn.; Miss.; Ala.; Georgia; Fla.	686	143	**543**
Iowa; Illinois; Wis.; Minn.; N. & S. Dakota	2,535	266	**2,269**
Montana, Wyoming, Nebraska	135	35	**100**
Kansas; Colo.; Missouri, Arkansas; Okla.	1,566	0	**1,556**
Texas; Louisiana, New Mexico	353	6	**347**
Oregon; Idaho; California; Arizona	2,745	40	**2,705**
Canadian Lines	0	0	0
Totals	16,897	4720	**12,177**
Same period 1912	14,042	5538	**8,504**

ANTHRACITE SHIPMENTS

Shipments of anthracite for January of the current year were the highest on record for that month, and fourth highest of any month. The following is a comparative statement of shipments for December and January of the last two years:

	December		January	
	1912	1911	1913	1912
Phila. & Reading	1,223,880	1,238,727	1,257,132	1,186,534
Lehigh Valley	1,108,765	1,109,705	1,175,151	1,020,447
Cent. R.R. N. J.	760,479	820,963	813,367	760,035
Del. Lack. & West.	850,977	827,248	922,099	791,698
Del. & Hudson	598,969	592,922	653,177	567,279
Pennsylvania	543,361	600,803	576,552	542,819
Erie	667,532	722,093	717,235	682,845
Ont. & Western	190,539	202,966	221,706	212,039
Total	5,944,502	6,115,427	6,336,419	5,763,696

CHESAPEAKE & OHIO RY.

The following is a comparative statement of the coal and coke traffic over the lines of the C. & O. Ry., for November, and the five months ending Nov. 30, 1911-12, in short tons:

	November		Five Months	
Destination	1911	1912	1911	1912
Tidewater	284,872	252,447	1,603,154	1,466,758
East	200,002	211,684	869,191	963,386
West	825,597	731,129	4,798,527	4,222,603
Total	1,310,471	1,195,260	7,270,872	6,652,747
Coke	18,605	24,216	93,040	111,392
From Connections				
Bituminous	18,464	69,230	94,122	175,687
Antracite	2,273	1,198	15,411	5,430

IMPORTS AND EXPORTS

The following is a comparative statement of imports and exports in the United States for the first 11 months of 1910-11-12, and for November of 1911-12, in long tons:

	11 Months			November	
Imports	1910	1911	1912	1911	1912
Anthracite	.....	54	1,670	12	13
Bituminous	1,815,356	1,101,228	1,480,503	102,475	142,612
Coke	147,555	65,843	95,732	4,959	9,307
Exports					
Anthracite	2,754,214	3,312,755	3,404,958	296,628	372,267
Bituminous					
Canada	7,083,881	9,917,740	9,838,701	984,696	930,733
Panama	447,608	451,743	423,327	34,267	27,100
Mexico	627,230	449,671	269,007	31,192	12,350
Cuba	777,142	941,504	1,033,220	87,666	89,958
West Indies	414,676	511,608	602,406	64,251	38,458
Other countires	671,760	608,076	1,383,092	34,339	55,378
Total	10,022,297	12,880,342	13,549,753	1,236,411	1,153,977
Bunker coal	5,933,516	6,118,474	6,766,443	534,997	610,153

CONNELLSVILLE COKE

The "Courier" reports production and shipments in the Connellsville region for the week ended Feb. 8, as follows:

Production (tons)	Week	6 weeks	*Shipments (cars)*	Week	6 weeks
			Pittsburgh	4,344	21,666
Connellsville	225,207	1,228,882	W. of Pittsburgh	6,825	34,173
Lower Connellsv'le	182,162	924,462	E. of Region	871	4,484
Total	407,369	2,153,344	Total	12,040	60,323
Same period 1912	354,569	2,109,842	Same period 1912	10,590	62,133

FOREIGN MARKETS

GREAT BRITAIN

Jan. 31—The market is weak in places for spot loading, due to tonnage being delayed by stormy weather. For forward loading quotations are on a firm basis. Prices are approximately as follows:

Best Welsh steam	$4.56	Best Monmouthshires	$4.20
Best seconds	4.44	Seconds	4.08
Seconds	4.32	Best Cardiff smalls	3.60
Best dry coals	4.62	Seconds	3.36

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days —less 2½%.

Spanish Imports of coal for 11 months to Nov. 30, 1912 were 2,118,948 tons as compared with 1,834,315 tons for same period the year previous. Coke imports over same periods were 327,325 and 293,841 tons respectively. Practically all imports are from Great Britain.

COAL SECURITIES

The following table gives the range of various active coal securities and dividends paid during the week ending Feb. 8:

	Week's Range			Year's Range	
Stocks	High	Low	Last	High	Low
American Coal Products	90	90	90	....	....
American Coal Products Pref.	111	111	111	....	....
Colorado Fuel & Iron	41⅛	38	39⅛	41⅛	31
Consolidation Coal of Maryland	102⅜	102⅜	102⅜	102⅜	102⅜
Island Creek Coal Pref.	86	85	85	....	....
Lehigh Valley Coal Sales	240	204	204	....	....
Pittsburgh Coal	23⅛	22⅜	23⅛	24⅜	21⅛
Pittsburgh Coal Pref.	92⅜	91	91⅛	95	87
Pond Creek	27	25⅛	25⅞	28⅛	24⅛
Reading	166⅛	164⅛	165⅜	168⅛	160⅜
Reading 1st Pref.	91	90⅜	90⅜	91½	90
Reading 2nd Pref.	91⅞	91½	91⅜	93	91
Virginia Iron, Coal & Coke	54	54	54	54	52

Bonds	Closing Bid	Asked	Week's Range or Last Sale		Year's Range	
Colo. F. & I. gen. s.f.g 5s	98⅛	100	99	99⅛	98	99⅛
Colo. F. & I. gen. 6s	107½	....	107½	June '12	....	....
Col. Ind. 1st & coll. 5s. gu	84½	Sale	84	85	83½	85
Cons. Ind. Coal Me. 1s 5s	....	....	85	June '11	....	....
Cons. Coal 1st and ref. 5s	....	94	93	Oct. '12	....	....
Gr. Riv. Coal & C. 1st g 6s	95	....	102⅜	Apr. '06	....	....
K. & H. C. & C. 1st s f g 5s	....	....	98	Jan. '13	98	98
Pocah. Con. Coll. 1st s f 5s	87½	Sale	87½	87½	87½	87½
St. L. Rky. Mt. & Pac. 1st 5s	77	77½	77½	Jan. '13	77½	80
Tenn. Coal gen. 5s	102	103	103	Jan. '13	102½	103
Birm. Div. 1st consol. 6s	102½	....	103	Jan. '13	103	103
Tenn. Div. 1st g 6s	101½	103	101½	Dec. '12	....	....
Cah. C. M. Co. 1st g 6s	....	....	110	Jan. '09	....	....
Utah Fuel 1st g 5s	....	....	....	....	....	....
Victor Fuel 1st s f 5s	79½	84	85½	Oct. '12	....	....
Va. I. Coal & Coke 1st g 5s	97½	98	97½	98	96½	98

No Important Dividends were announced during the week.

FINANCIAL DEPARTMENT

Philadelphia & Reading Coal & Iron Co.

BALANCE SHEET TO JUNE 30

Assets—	1912	1911	1910
Coal lands	$49,397,660	$49,913,026	$50,385,196
Timber lands	841,691	841,691	841,568
New York and Eastern depots	839,540	839,540	790,097
Western yards and depots	1,736,979	1,651,644	1,351,571
Miners' and other houses	553,138	553,138	553,138
Pottsville shops, real estate, etc	391,463	391,463	376,169
Storage yards and washeries	851,892	851,892	851,892
Other real estate	388,425	388,425	386,339
Improvements and equip. at collieries	12,959,224	12,959,224	12,959,224
Stocks and bonds of, and loans to, cos. contr'd	9,863,915	9,863,915	9,563,915
Cash on hand	2,692,618	456,949	678,200
Coal accounts	3,221,693	3,480,268	3,109,475
Rent accounts	24,164	29,647	35,228
Companies and individuals	796,146	854,524	734,917
Coal on hand	776,701	3,333,268	3,817,482
Supplies and materials on hand	1,236,240	1,517,489	1,406,986
Depletion of coal lands fund	.....	.....	300,004
Stocks, bonds and mortgages, owned, etc	76,034	73,151	72,905
Total assets	86,647,523	87,999,254	88,214,307
Liabilities—			
Capital stock	8,000,000	8,000,000	8,000,000
Bonds	1,110,000	1,140,000	1,170,000
Reading Company	73,466,530	74,423,817	75,395,787
Pay-rolls and vouchers	1,033,421	1,147,656	980,244
Phila. & Reading Ry. current account	647,870	1,274,437	564,933
Interest, taxes and miscellaneous	930,008	725,225	711,908
Profit and loss	1,459,694	1,288,119	1,391,435
Total liabilities	86,647,523	87,999,254	88,214,307

INCOME ACCOUNT

Earnings—	1911—12	1910—11	1909—10	1908—09
Anthracite coal	$34,021,026	$32,695,271	$31,619,652	$33,411,277
Bituminous coal	1,186,203	1,152,915	1,080,489	909,809
Coal rents and miscell	526,424	541,944	517,794	471,606
Earnings	35,733,653	34,390,130	33,217,936	34,792,694
Expenses—				
Fixed charges and taxes	85,455	86,598	88,818	106,876
Mining coal and repairs	18,382,202	18,194,578	17,616,030	18,091,769
Coal purchased (anth.)	1,618,059	1,906,678	1,826,169	2,111,246
Coal purchased (bitum.)	1,100,315	1,070,566	1,040,909	838,169
Royalty leased collieries	458,523	510,687	563,224	594,182
Transportation of coal by rail	6,704,904	7,114,995	7,250,288	7,909,920
Transportation of coal by water	995,791	1,140,540	1,042,277	1,170,408
Handling coal at depots, taxes on coal lands, imports., coal sold from stock and miscellaneous	4,513,002	2,895,524	*1,455,880	*1,330,175
Colliery improvements	839,742	1,139,041	1,216,015	1,172,205
Depletion coal land fund	.....	.....	445,868	465,768
Int. on Reading Co. loan	864,084	375,573	743,958	935,003
Int. on Trem. C. Co. bonds matured, amount adv	.....	58,667	.....	.....
Total expenses	35,562,077	34,493,447	33,289,437	34,725,720
Balance, sur. or deficit	sur. 171,576	def. 103,317	def. 71,501	sur. 66,974

* In 1909—10 this item amounted to $1,878,628, less $422,748 coal added to stock—$1,455,880; in 1908-09, $1,809,042, less $478,867 coal added to stock —$1,330,175.

Nova Scotia Steel & Coal Co.

The following is an abstract from the general manager's report for the fiscal year ended Dec. 31, 1911:

The company controls for periods of from 2 to 10 years, 6 large steamers, totalling about 42,000 tons dead weight, chartered sometime ago. Several additional steamers will be required to move the ore and coal tonnage of 1912. Two steamers of about 13,000 tons deadweight capacity each were put in the service in May last. These boats are under contract for 10 years, the hire paid being based on a certain percentage of the cost of the vessels. One of these boats landed 37,560 tons of ore in Philadelphia during August; The total tonnage carried by the fleet was in the vicinity of 1,000,000 tons, of which more than one-half was iron ore.

Iron-ore mining at Wabana passed through a period of transition, due to the substitution of submarine for surface mining; the quantity mined, however, was nearly 25,000 tons more than during 1910, but owing to the severe weather during December, and other causes, the actual shipments were less than would have been the case under normal conditions. It is expected that 1912 will show a substantial increase in shipments.

The main haulage slope at Wabana was driven 1835 ft., while levels east and west of the main slopes have been driven 2335 ft., opening up a considerable amount of productive territory. In all, more than 5000 ft. of slopes, crosscuts, rises and levels have been driven in the submarine ore territory during the year. No serious difficulties were encountered, and exploration and development work done has further increased the quantity of proven ore in this property.

OUTPUT OF CALENDAR YEARS (IN TONS)

	Coal	Wab. Ore	Coke	Pig Iron	Steel In.	Steel Billets	Bars, etc.
1911	780,468	521,011	97,580	84,497	83,718	78,004	(?)
1910	847,176	532,058	90,360	65,484	73,019	59,244	50,915
1909	809,341	460,387	87,816	58,676	64,240	52,931	45,090

RESULTS FOR CALENDAR YEARS

	1911	1910	1909	1908
Profits for the year	$1,019,392	$1,140,504	$799,978	$586,767
Government bounties *a*	.....	.....	107,971	147,935
Total profits	$1,019,392	$1,140,504	$907,949	$734,702
Balance brought forward	500,603	336,807	1,219,221	1,202,604
Deduct 20% stock div., declared Dec. 1909	.....	.....	1,000,000	.....
Total available	$1,519,995	$1,477,311	$1,127,170	$1,937,306
Deduct—				
Interest on bonds, etc	$291,169	$248,000	$247,837	$263,650
Accrued int. on bonds	.....	.....	.....	18,000
Int. on debenture stock	60,000	60,000	30,000	.....
Depreciation and renewals	96,124	79,371	77,669	76,746
Div. on pref. stock (8%)	82,400	82,400	82,400	82,400
Div. on common stock (6%)	360,000	(4½) 270,000	(1) 60,000	(1½) 74,814
Disc., etc., on bonds issued	.....	218,103	*b* 184,453	.....
Improvements and betterments	73,881		52,174	86,808
Sinking fund and miscel	47,876	18,834	55,830	115,667
Total	$1,011,450	$976,708	$790,363	$718,085
Surplus carried forward	$508,545	$500,603	$336,807	$1,219,221

a Under the Act of April 27, 1907, the Government bounties expire in 1910.
b Commissions and premiums on converting bond issues written off.

BALANCE SHEET DECEMBER 31.

Assets—	1911	1910	1909
Property and mines	$14,489,286	$13,490,554	$12,582,191
Inventories	1,338,128	1,245,682	1,134,259
Ledger accounts and bills receivable	590,543	606,857	662,280
Cash	397,289	498,788	207,029
Total	$16,815,247	$15,841,881	$14,585,759
Liabilities—			
Preferred stock	$1,030,000	$1,030,000	$1,030,000
Common stock	6,000,000	6,000,000	6,000,000
Bonds	4,933,900	4,960,000	3,500,000
Sinking fund	26,101	.....	607,459
Debenture stock	1,000,000	1,000,000	1,000,000
General reserve	750,000	750,000	750,000
Bills payable	775,000	.....	.....
Pay-rolls and accounts not due	440,691	304,597	193,551
Coupons (January)	123,347	124,000	87,500
Coupons not presented	1,540	843	.....
Debenture stock interest Jan. 1	30,000	30,000	30,000
Dividend on preferred Jan. 15	20,600	20,600	20,600
Dividend on common Jan. 15	90,000	75,000	60,000
Reserve for depreciation, etc	1,023,332	994,624	924,562
Insurance funds	62,191	51,614	45,280
Profit and loss	508,545	500,603	336,807
Total	$16,815,247	$15,841,881	$14,585,759

Maryland-Georges Creek Coal Co.—This company was incorporated in Maryland in September, 1912, and has a paid-up capital of $1,500,000. It has recently floated a large bond issue which is secured by 2470 acres owned in fee, 661 acres of coal without surface and 41 acres of surface, a total of 3172 acres located in the Maryland-Georges Creek coal basin, nine miles from Cumberland, Md. The mortgage also covers mining plant, miners' houses, etc., charged on the books at $120,000 along with $80,000 for other equipment. The sinking fund is 10c. per ton of mine-run coal and 5c. a ton on all clay mined with a minimum for 1913 of $10,000; 1914, of $15,000; 1915, of $20,000; 1916, $25,000; 1917 to 1931, $33,000 per year, and 1932, $35,000 to retire bonds at not to exceed $105 and interest.